RAILROAD GAZETTE

FRIDAY, SEPT. 1, 1893.

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Contributions.

The Future Motive Power for Elevated Railroads.

BROOKLYN, Aug 22, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I read with interest your editorial of Aug. 4 on increasing tractive power on elevated railroad lines. My attention had been called to the solution you suggest some years ago by observation of some of the various types of engines with "bogie" driver trucks, now carried to such a radical extreme in the Johnstone engine.

The new Lake street engines weigh about 30 tons, of which, say, 20 tons is on the drivers and effective for traction; in the Mallet engine the whole weight would be effective for traction, or an engine of 20 tons weight would do the same work.

One serious defect of the "bogie" type of engines would seem to be the neccessity of using small wheels which would interfere with increase of speed, and without greater speed the elevated lines must suffer in competition with street surface lines which have materially increased their speed.

I believe that the maximum economic and convenient length for elevated trains will not exceed six cars, especially with the heavy grades of the older lines. The speed of trains must be increased, particularly for long-distance travel, and this is the chief reason why electricity is not likely to be tried on elevated lines at once. The desired maximum speed of, say, 45 miles per hour has not as yet been promised even for electric motors.

It is not an electric locomotive that is wanted, but rather a system of electric motors applied to the cars able to draw trains at good speed with economy. Whether this can be done with, say, 36-in. wheels is the question for the electric companies to determine. A train thus equipped would be self-contained, the inconvenient relay engine would disappear, and simplicity of operation result. This system would embody one of the essential suggestions of your editorial, the distribution of tractive loads over greater length of structure, and all of the structures would be strong enough to meet the requirements of increase in length of trains to the limit of convenience.

The electric locomotive, recently built for exhibition at Chicago, and said to be specially designed for elevated service, seems to ignore the essential requisite for such a motor, that it must not increase the present loading. This locomotive weighs 30 tons for length of 16½ ft., while the Lake street locomotive weighs 30 tons for length of 26½ ft. It would seem that an engine of 20 tons should do the same work as the latter engine if, as in the electric engine, all the weight is on the drivers.

The electric locomotive, as designed, followed by a standard elevated coach, would require a structure 50 per cent. stronger than our best types and it would not be safe to use it on any continuous line of elevated road with which I am familiar. CONSERVATIVE.

The Material for Couplers.

The Drexel Railway Supply Co.,
CHICAGO, Aug. 7, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We are sorry to continue further the discussion of the relative merits of malleable iron and cast steel for couplers, and do so only from the desire to secure a correct understanding of the matter. In your recent editorial on the subject you object to the criticisms of "Steel Coupler," in the first place because you say that in this discussion you were considering the *material* for couplers and not the couplers themselves. If it were your intention to deal only with the *material* you did wrong in drawing conclusions from tests made of *couplers* and not of *material*. Such conclusions would only be warrantable after tests of test bars of uniform dimensions from the various materials offered; for it is possible that all the couplers of one material might be so faulty in design that that material would make a very much poorer showing than the other material, when, as a matter of fact, if tested in couplers of the same design it might make a very much better showing. It would seem then that, if, as you say, you are dealing only with the *material* for couplers, that your first objection to the criticisms offered has not proved that you are warranted in drawing such a conclusion as you did, or in fact any conclusion whatever, as this test was not a test of material but of couplers.

In your next paragraph you claim that only the brands of the various materials should be averaged and not the different couplers made from these various brands. We would ask then how you are to get the average of the cast steel from these various brands; that is whether you shall take the couplers standing the best or the poorest tests under each brand. If you take the former then the average of cast steel is vastly better than the two special brands of malleable. If you take the poorest records made by each brand (a manifestly unfair comparison) the malleable iron is far from "vastly better" than the average of cast steel. It seems that what you really did mean when you made the statement, that "malleable iron in its best form is vastly better than the average of cast steel for coupler heads," was that the special brands of malleable iron are better than the poorest brands of cast steel, but even this statement is unfair to a certain extent, unless it is stated at the same time that very few couplers of these two poorer brands are offered for sale and by far the majority of the steel couplers on the market to-day are of the two best brands.

The whole tenor of this last editorial and of your former article seemed to be that as malleable iron in its best form does not exceed the requirements of the M. C. B. tests that it is good enough, and why pay more for steel? This is rather an assumption that those who fixed the M. C. B. tests were possessed of supernatural wisdom and placed it precisely at the proper point, and that there is no advantage to be gained, as far as service is concerned, by having a coupler exceed this test; that it is a crucial point, which, when once passed, every coupler, no matter how much it surpasses it, is on an equality with all others passing it. Unfortunately we cannot believe any such wisdom displayed in fixing this test. It was only chance that it was not made at the point that would exclude the two special brands of malleable.

You will pardon us if we still insist that your conclusion in your first editorial was wrong and that in your second editorial you have failed to disprove the fact that cast steel, in any fair way that it can be considered, is vastly better for coupler heads than malleable iron

STEEL COUPLER.

Head or Feet to the Engine—Which?

TO THE EDITOR OF THE RAILROAD GAZETTE:

This is a common question in sleeping cars, asked of passengers by porters, and often answered with much hesitation. A few years ago there was but one way thought of, and a man who had his berth made up with his head to the engine was regarded as a crank. Now, however, the exception has become the rule, and the crank's way has become the usual way.

On a recent excursion of railroad and supply men to one of their conventions I was surprised to see that when the time came to retire, nearly all of the passengers had their berths made up with the pillows at the forward end of the berth. Inquiry next morning elicited some amusing facts given by different men as reasons for sleeping with their heads to the engine. There was the man who wanted his head to the *east* and who never slept well in any other position. Then there was the electrical crank who explains every phenomenon by his pet electrical theories. Another with greater confidence in inertia than electricity explained how the drawing motion of the engine caused the blood to flow away from the head to the feet and thus relieve the brain and permit sleep and rest. Other equally unscientific and unsatisfactory reasons were assigned; but whatever the reason there seemed to be a pretty general feeling that the way to sleep was with the head to the engine. Old travelers said they slept better, and that anybody had but to try it to be convinced.

Now these people may have indulged in an excessive amount of theorizing, but there is a pretty general sentiment among travelers that they sleep better with their head to the engine, and I have sought some other reason than that of the points of the compass, electricity or inertia.

Every youth who has been in swimming and jumped and dived off from banks and bridges, knows what the sensation is when he jumps and when he dives, and usually prefers to dive. Everyone knows the peculiar sensation of the stomach when he goes down in an elevator, but he never feels this sensation when he goes up, and I believe he would not when he went down if he went head foremost. Now the motion of an elevator is not nearly so fast as that of an express train, and although the unpleasant feeling ceases for the most part when the elevator has acquired a uniform velocity, yet it does not altogether, and every increase in the speed occasions that disagreeable feeling which is commensurate with the change in velocity.

This explanation is at most but a conjecture and the officials and conductors of the sleeping car companies give little credit to such beliefs, regarding them as mere whims and fancies.

But there are better and more practical reasons why one should sleep with his head to the engine. The very best reason is to secure good ventilation without exposing oneself to dust and dangerous drafts of air. If in summer, when the car is close and hot, the windows may be opened and screens put in and the draft of air and dust driven toward the rear of the car, to the feet which one usually covers. If the rear window of the berth alone is open then the dust and draft is over a part of the body which is unexposed, and dirt and coughs and colds are escaped. If no windows are opened, then to avoid colds and dust one should still sleep with the head foremost, for then the air-tight partition prevents the draft from blowing upon the head through between the curtains, it being driven by the movement of the train toward the rear, to the feet.

Porters are now instructed to ask passengers which way they prefer to have the berth made up, and I learn that the majority of passengers prefer to sleep head foremost. In a head collision most persons would sooner run the risk of having their legs broken than their neck, and no doubt anyone would prefer to stand the shock of a sudden stop with his legs; and this seems to be the only argument in favor of sleeping feet foremost, but deaths from colds and consequent complications contracted by sleeping in a draft are probably far more numerous than those from head collisions.

It may be interesting to know that some of the most prominent officials in the sleeping car service ride feet foremost. S. U. P. PLYMAN.

Krupp Exhibit at the World's Fair.

Railroad Material.—The display of railroad material made by Krupp at the World's Fair, while not as great as that of guns and war material, is extensive and varied. The largest showing is of tires, of which there are more than 50 of different diameters, some with segments cut out to show the method of fastening. Two methods are shown, with the retaining ring and with the spring ring.

The wheel exhibit comprises spoke wheels of forged iron and cast steel, also a complete set of disk wheels, among the latter being types used by various roads and car companies in America. The high perfection which the molded steel castings have reached in the works at Essen is made evident by several important pieces, and the excellent qualities of the material are shown by three distorted spoke wheel centres which have been bent in several ways. The spokes and rim of one have been bent and twisted cold under a hydraulic press in order to show the tenacity of the material; another has been entirely bent cold under a hydraulic press, and the spokes and rim of the third one have been forged out, while hot, to show that the material can be readily forged. It is claimed for the steel castings that they excel in softness and ductility. The average breaking load is between 48,000 and 56,000 lbs., with an elongation as high as 34 per cent. The essential difference between tempered steel and steel castings, even castings of great thickness, is in the softness of the castings. The castings when cooled quickly from a high temperature do not harden, and after being so treated can still be bent without breaking.

It is possible to substitute in many cases such castings for forgings, and when it becomes possible to substitute in the frames for locomotives cast steel for wrought iron, it may be justly claimed that cast steel has indeed reached a high degree of perfection. The cast steel locomotive frames, as designed by Krupp for American locomotives, are shown by two frames in the Krupp pavilion. These are finished all over and have indications of containing first-class material, being very free from porous places. It is stated as probable that an American road will try a pair of these frames soon. There are shown in fig. 1 two designs each of cast steel frames, for freight and passenger locomotives. *A* and *D* are respectively the ordinary forged frames; *B* and *E* are cast steel frames having the same sections as the forged frames, and *C* and *F* are webbed frames, the material at the top and bottom edges of the frames and around the jaws being thicker than that in the web. The frames shown in *C* and *F* are of the more approved designs, and it is claimed for them that, while lighter than the others shown in *A* and *B* and *D* and *E* respectively, the resistance of each to breaking above the axle-boxes is three times that of the frames with rectangular section, either of wrought iron or of cast steel. The following table gives the approximate weight of each frame and the relative breaking resistance above axle-boxes.

Kind of frame.	Passenger.		Freight.	
	Weight	Rel. resistance to breaking.	Weight.	Rel resistance to breaking.
	Lbs.		Lbs.	
Welded frame	2,050	1	3,480	1
Cast st'el, old pat'rn.	1,940	1	3,310	1
Cast st'l, new pat'rn.	1,780	3	2,630	3

From this it will be seen that the new cast steel frame for passenger locomotives not only weighs 270 lbs. less than the welded frame, but is also three times stronger

over the boxes. In the case of the frame for freight locomotives, the difference in weight is greater, that of the new cast steel frame being 850 lbs. less than the welded and three times stronger over the boxes.

The pressed steel truck frame shown in fig. 2, while somewhat different from American practice, will be of considerable interest to American readers. The illustration was reproduced from a photograph, and shows the design quite distinctly.

Besides the above mentioned specially interesting objects in the exhibit may be mentioned a boiler plate which is the largest ever made; it is 65 ft. long, 10.82 ft. wide, 1.26 in. thick, and weighs 15.94 tons. Such plates as

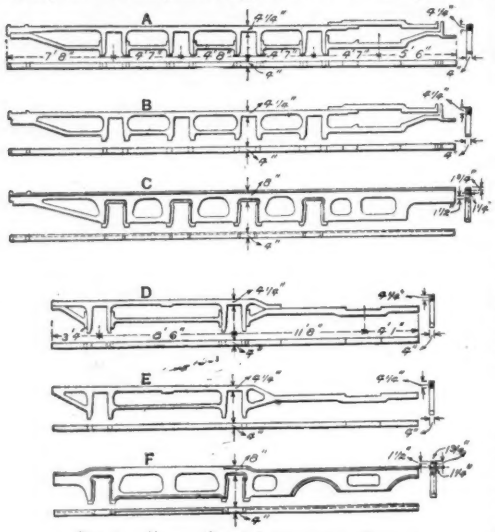


Fig. 1.—Krupp Steel Locomotive Frames

these allow the construction of the largest boilers with the fewest possible sheets, and only one seam in the circumference. There is also a boiler end plate rolled from one ingot; the diameter of the plate is 12.79 ft. The exhibit of railroad material contains also crank pins, coupling rods, piston rods, crank axles and pressed steel steam dome for American locomotives.

Marine and Other Castings and Forgings.—Among the very remarkable exhibits of cast steel made by Krupp is a bed plate weighing 6.21 tons, a wheel with rim and pinion weighing 19.88 tons. This pinion attracts considerable attention from all who can appreciate its merits, as it is a very clean, solid casting. There are also a stem consisting of three parts, the height of which is 41.4 ft. and weight 23 65 tons; a stern post and a rudder frame, each cast in one piece, their weights being respectively 12.59 tons and 11.12 tons. These two pieces were shipped from Ruhrort, the port of Essen, to Chicago entirely by water by way of New York and Buffalo.

A cast steel propeller for a steamer, the type of the "Spree" or "Havel," of the North German Lloyd, is shown in connection with its shaft, consisting of screw shaft, thrust shaft and crank shaft. The whole length is 90.34 ft. and the total weight 103.34 tons. The screw shaft, thrust shaft and crank shaft, were forged by hydraulic power from blocks about 4½ ft. in diameter. The crank shaft consists of three crank pins, six crank webs, and six coupling journals combined to form three cranks 120 deg. apart. The crank pins and the coupling journals are shrunk warm into the crank webs and

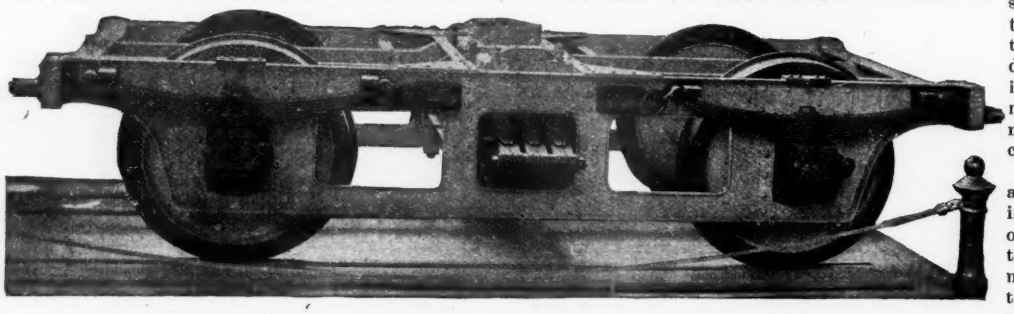


Fig. 2—Krupp Steel Truck.

the coupling journals are keyed in addition. The entire shaft and the three crank pins are bored out longitudinally. The remarkable thing about this shaft is the immense dimensions of the single parts. A very remarkable piece of work is a hollow shaft 82 ft. long, 11.81 in. in diameter, with a bore 4 32 in. in diameter. The shaft was forged by hydraulic power from a block of crucible steel 8 85 ft. long and 4.1 ft. in diameter. It was machined on a lathe, the bed of which is 111.5 ft. long, the maximum turning length of which is 98.4 ft. and the height of centres 2 29 ft. This is a fine specimen of forging and turning.

A description of the forgings is not complete without mention of a driving roll of crucible steel for an armor plate mill. Its width of face is 3 6 ft. with pitch circle 5.24 ft. in diameter. It has double helical teeth milled out of the solid metal, proof of this latter being had in the fact that the space for two teeth has been left solid. The weight of this driving roll is 19.68 tons.

War Material.—The Krupp exhibit of war material occupies considerably the larger part of their special building, which, building by the way, is an important thing in itself, being 196 ft. long, 82 ft. wide and 42 ft. high. Sixteen large guns are shown here, the biggest of which is 16½ in. caliber. We have already illustrated the method of transporting this from Sparrows Point to Chicago. This gun was built in 1886, and has been fired 16 times. Some of the other guns are a 12-in. rifle on a hydraulic ship carriage, the gun being worked entirely by hydraulic power; an 11-in. coast defense gun, and a 9.45-in. rifle which has a record of 21,870 yards, with a shell of 474 lbs. and a powder charge of 253.53 lbs. The armor plate exhibit consists of five plates; two compound and three nickel steel. These have been tested by firing, and the record of results is attached to them in the exhibit.

The Standard Rail Sections.

In our issue of Aug. 4 we announced the fact that the American Society of Civil Engineers' Committee on Standard Rail Sections had made its final report; and the following week, Aug. 11, we gave a description of the chief characteristics of the proposed sections, which covered the matter sufficiently for most purposes. The Secretary of that Committee has within a week given out the text of the reports of the Committee and blueprints of the sections, all of which are published herewith. The sections are reproduced to about one-half size. The dimensions which are common to all weights appear only on the 100-lb. section.

FINAL REPORT OF THE COMMITTEE.

. . . Since the progress report of the Committee, which was presented and accepted at the annual meeting of the Society, Jan. 21, 1891, your Committee has held a number of meetings and conducted an extensive correspondence with many of the chief engineers of the railroad systems of the country. The carefully prepared reports of the Committee of Society on "the Proper Relation to Each Other of the Sections of Railway Wheels and Rails," and the papers and discussions of the Society called forth by them, gave your Committee valuable data as the basis of their work. The first result of their deliberations was the preparation and discussion of several series of rail sections. As will be seen by reference to the progress report, there were originally considerable differences in the views of the several members. Correspondence, observation of the results obtained from rails in actual use, and discussion have reconciled these differences, so that your Committee is able to present a final report.

As the mileage of practically straight track so much exceeds that on curves, it seemed wise to select sections which would give the most satisfactory results on the greater percentage; if at the same time such service would extend to curved track, so much the better. We are satisfied that the sections recommended are the best for straight track, and that if the rails are properly laid they will do well on curves.

Our investigation developed that the greatest difference of opinion among the railroad engineers of the country as to rail sections was upon the proper radius for the top corners of the rail heads. In the correspondence which we present as an appendix to this report it will be seen that this point is the most discussed. Most of these letters were received in reply to a final circular letter of inquiry which was sent to the chief engineers of every railroad having 100 miles and over of track. Fifty-five replies were received, and of these we present those giving decided opinions.

In deciding upon a series of sections your Committee has given consideration to the manufacturing details of rail making, while seeking designs whose forms would be best adapted to meet the various requirements of traffic.

To have a smooth track, it is absolutely necessary that the surface and line of the rails shall be without lumps and kinks. To obtain such rails it is of importance that the metal in the head and flange of the section should be as nearly balanced as economy will permit; thereby permitting the hot metal in the just rolled rail to cool with the least internal strain; and thus when cold to be as nearly as possible straight in all directions, thus avoiding excessive "gagging" in the final cold straightening. The importance of this increases with the amount of metal in the section. We decided upon 42 per cent. metal for the head; 21 per cent. for the web; and 37 per cent. for the flange. The other constant factors are top radius of head 12 in.; top corner radius of head $\frac{5}{16}$ in.; lower corner radius $\frac{1}{16}$ in.; corners of flange $\frac{1}{16}$ in.; side radius of web 12 in.; top and bottom radii of web ¼ in.; angles of underside of head and top of flange, 13 deg.

As the grain or fineness of hot rolled steel is governed by the work applied to it as its heat decreases, and as we are convinced that the wearing qualities of rails largely depend on the closeness of the grain of the steel in their heads, we have sought to design heads which, so far as permitted by the other proportions of the sections, will be affected to the greatest extent by the pressure or work of the rolls.

One of the difficulties in rail manufacture is obtaining perfect flanges. The amount of metal being much less in the flange edges than elsewhere in the section, it cools more rapidly; hence, if the flange is both wide and thin, difficulty will be experienced in making it fill out to the full designed width, and also in preventing the development of flaws, which if detected, will condemn the rail as first quality, but which may be so concealed as to escape detection and exist as a constant menace to the safety of the rail. These considerations influenced us in designing our flange sections.

At the meeting of the Committee, which was held in the Society's House on Dec. 2, 1892, all of the members present congratulated themselves upon the, to them, satisfactory progress of their labors, and separated, little thinking that before another meeting of the Committee could be held the hand of death would be laid upon one of the members of the Committee. H. Stanley Goodwin was not present at that meeting, official duties preventing at the last moment, but he telegraphed his views, and later wrote the Secretary of the Committee indorsing the Committee's proceedings. To know Mr. Goodwin was to respect him; to be thrown intimately with him was to yield the warmer tribute of friendship. Your Committee unite with all the members of the American Society of Civil Engineers in deploring the loss of so valued a member, and one who was so useful to his fellow-men.

G. BOUSCAREN, Chairman, SAMUEL REA,
VIRGIL BOUGE, THOS. RODD,
FOSTER CROWELL, A. M. WELLINGTON,
S. M. FELTON, F. M. WILDER,
J. D. HAWKS, ROBERT W. HUNT, Secretary.
E. T. D. MYERS,

MINORITY REPORT ON STANDARD RAIL SECTIOS.

I concur in the foregoing report in all respects except one, the width of the heads. If the same wheels are to run over all rails the portion of the rail which comes in contact with the wheel should always be of the same form. Taking the 80-lb. rail with its 2½-in. head as standard, the same width of head should be maintained for all sections likely to be used. The slight reduction in width of head proposed for the 60-lb. and intermediate sections is comparatively unobjectionable, and I consented to approve the whole report if the same rate of variation had been maintained for the larger sections; the variation in width would then not exceed ¼ in. or ⅛ in. from the mean. The present large variation of ¼ in. from the mean to the maximum section is too great, and I cannot accept this portion of the report. I present the sections herewith appended. GEORGE S. MORISON.

The appendix, containing letters discussing the matter, and the drawings of Mr. Morison's proposed sections, are not received.

Some of the Cold Saws at the Fair.

A very interesting display in Machinery Hall is that of Heinrich Ehrhardt, of Düsseldorf, consisting mainly of cold-sawing machinery. This firm makes a specialty of cold saws, tire and wheel lathes, machine tools for the straightening and finishing of angle irons, T irons and other rolled shapes, manufacturing of wrought iron tubes and fittings and testing and measuring appliances of various kinds.

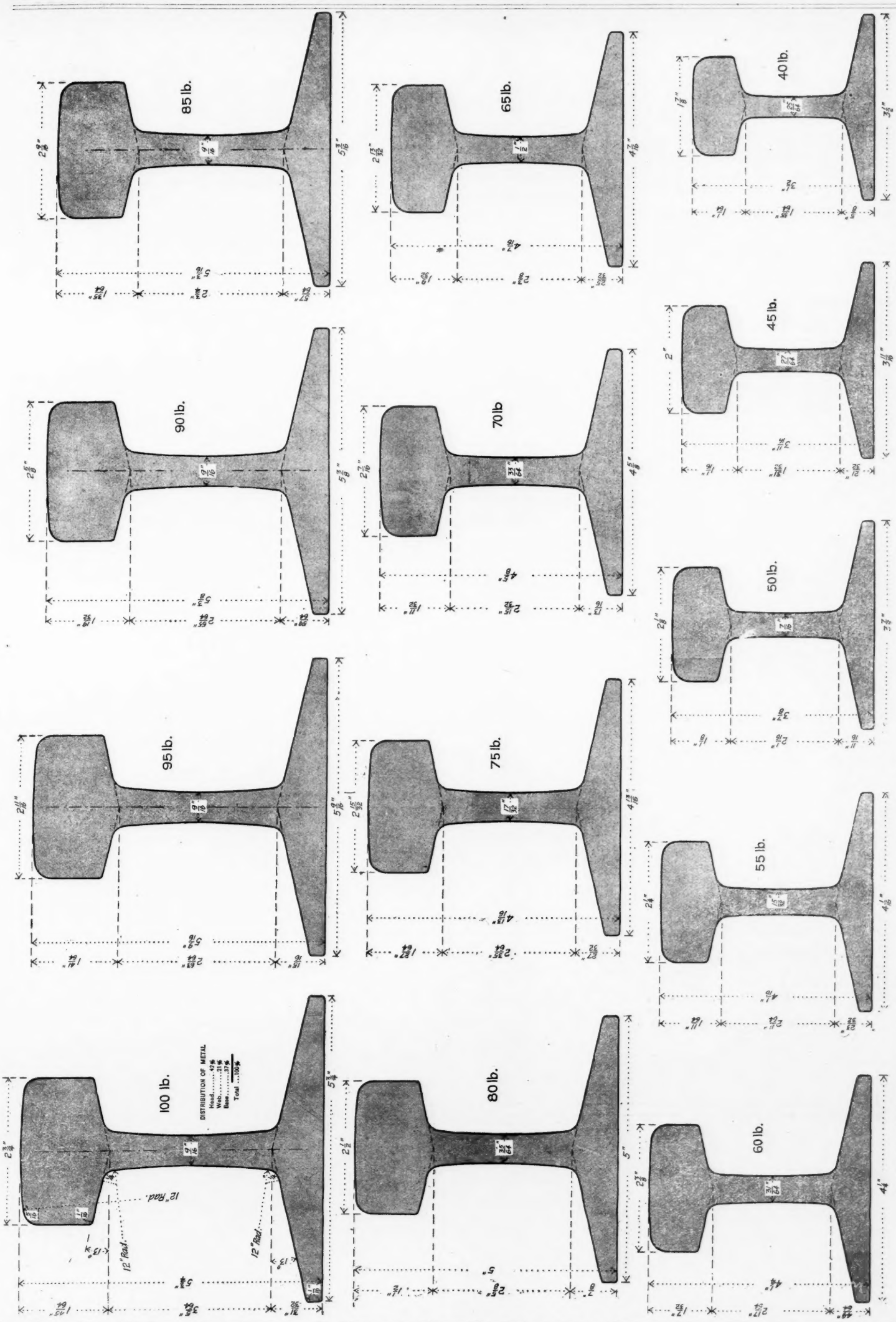
Among the pieces on exhibition is a universal rail saw mounted on four wheels, intended especially for track use, and arranged to be driven by hand. This machine is also adapted for bending and drilling rails, and has an attachment for sharpening saws. A small saw intended for general shop use is also shown, driven by means of a small Siemens & Halske motor. The reduction from the armature speed is made by worm gearing.

One of the larger and more elaborate saws is a radial scroll saw for cutting iron or steel plate on curved lines. The saw cuts on its downward stroke and receives its motion from a cross-head, to which its upper end is clamped, and which is actuated by a crank and connecting rod. The saw is made taut by a heavy iron ball hung on its lower end. The direction of the cut is controlled by a lever and worm gearing attached to the head which carries the saw, and by means of which the saw can be made to move in any direction at the will of the operator. The saw is made to advance by a small-toothed wheel bearing on the plate at its side, and driven by a belt from above. The table of the machine is arranged only for motion to and from the post. This machine is driven by a Siemens & Halske motor, mounted on the top of the post, the reduction in this case being effected by belting.

A small mitering circular saw intended for cutting architectural iron at various angles is also shown, having two adjustments of the head which carries the saw, one in a horizontal plane by which the saw can be turned to cut in any direction, and another which permits the saw to be turned from the usual vertical position of circular saws. The head carrying the latter adjustment is fed downward by hand at an angle of 45 deg., the work being suitably clamped in place on a small table. This machine is driven from the main shafting.

A heavy horizontal cold saw, suitable for general work within its capacity, is also driven from the main shafting. The saw head of this machine has a horizontal motion of about two feet, and can be fed either by hand or power. The table to which the work is clamped or bolted has both a vertical feed and a horizontal or cross feed in two directions.

This firm also exhibits a band saw with cross feed, suitable for large work, driven by an electric motor made by Siemens & Halske, a small horizontal portable saw to be operated by hand, and a patent lever cut-off saw for general use, driven by a motor and feeding by gravity; the weight of the saw and its frame being made available for this purpose by hinging it upon the main shaft, and allowing the saw arbor to move in the arc of a circle about the shaft as a centre. The firm has also on exhibition an automatic saw-



A SERIES OF RAIL SECTIONS, RECOMMENDED AS STANDARD BY THE COMMITTEE OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS ON STANDARD RAIL SECTIONS. TO ACCOMPANY A REPORT PRESENTED AUG. 2, 1893, AT THE SUMMER CONVENTION AT CHICAGO.

sharpening machine, which sharpens the teeth of a circular saw by means of a soft steel worm-shaped sheave, saws of various sizes, some of the larger ones having adjustable teeth, and intended for sawing armor plate and other heavy work, pipes and other hollow bodies manufactured by Ehrhardt's patent process, and a number of tools designed for use with Ehrhardt's patent heel lathe.

The Work on the Chicago Main Drainage Canal.

At a meeting of the Drainage Board's Joint Committee on Engineering and Finance, July 21, preliminary action was taken in regard to the contractors who are behind in their work. A full discussion was had of the present condition of the work along the line of the main channel, and the clerk was directed to request all the bondsmen of Agnew & Company to meet the Committee and other members of the Board at a conference to be held on the 22d. It is understood the bondsmen will be notified that unless steps are taken at once by these contractors to put their work on proper basis, the contracts will be declared forfeited, and bondsmen held responsible for damages.

Complete statements of the condition of the work on

all sections between Summit and Lockport were made by Mr. Weston, Superintendent of Construction. From these it appeared that most of the contractors were making satisfactory progress, and on one section, No. 13, they were in advance of the requirement to date. This was true of the majority of the sections between Willow Springs and Summit.

Of the other contractors, Arthur Harley is far behind on section No. 1, and has abandoned the river division. This is a vital part of the work, and if uncompleted before winter the sections below will be flooded next spring. New contracts have been advertised for sections Nos. 2, 3 and 4, which were lately forfeited by McArthur Bros.

It also developed at the meeting that laborers on the sections have been frequently paid in time checks, several thousand dollars' worthof which have been discounted in Lemont. Not only have laborers suffered a loss of 20 or 25 per cent., but the holders of the paper now find they cannot collect anything. The matter of employing day labor on the channel was not discussed, but Trustee Cooley is of the opinion the outlay necessary to equip the men with tools and machinery will be prohibitive.

Twelve-Wheel, Side-Dump Ore-Car.

Herewith is illustrated a side-dump car of 80,000 lbs. capacity, which is interesting from its having three trucks. These cars were built to carry coal and ore over long distances and are sometimes loaded with 50 tons.

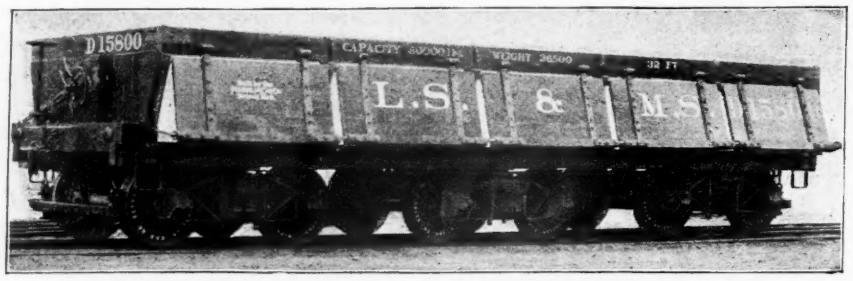


Fig. 1—Twelve-Wheel, Side-Dump Ore-Car.

The Lake Shore & Michigan Southern owns and operates 50 of them, and the New York, Lake Erie & Western has 40 in service. The Lake Shore has had its cars in constant service for five years and they have rarely been in the repair shops, and the Erie reports them as being cheap cars to maintain.

The middle truck is the distinctive feature, and as built it has given no trouble to either railroad. Except as to the attachment to the car body, it does not differ from the end trucks. Instead of the regular rub iron and circular centre plate the middle of the car is supported by four rollers which roll or travel in channel castings bolted to the truck with the channel transverse to the car length. This permits lateral motion of the truck upon curves. Two of these rollers travel upon a channeled centre plate with a king bolt between them. The rollers are 7 in. face and 7 in. diameter. (See side elevation, fig. 2.) The hole for the king bolt is slotted so as to give 5 in. lateral motion to the truck. This lateral motion should permit the car to pass over an 18 deg. curve. The rollers are cast with round cylindrical lugs at the ends that act as journals and are fitted into bearings bolted to the body bolster.

Little difficulty was anticipated from horizontal curves in the track, but more was feared from sharp vertical curves or "humps," such as are frequent on coal dumps and ore shutes where the incline meets the level track of the trestle. Inquiry with regard to this brought replies that no trouble had been experienced in such places, and though the cars had been over such "humps" no timbers had been broken or cars derailed. The cars are handled daily on coal and ore shutes. Probably the action of the springs compensates for such inequalities of track; but at such places two of the trucks must carry more than their proportionate loads and the springs must be considerably deflected.

The cars built by the two railroads are almost identical in design. The side dump doors are closed by chains wound about a central shaft running through the length of the car. This shaft is turned by a winch having four radial arms, placed at the end of the car and over the coupler as shown in fig. 3. The dimensions and general details of the car are given in the illustrations and little can be said in further explanation of those parts.

It is said that the device for using the middle truck in the manner shown is patented, but this fact or the name of the patentee does not appear upon the drawings or the cars.

After five years of satisfactory service the car can hardly be called an innovation; yet it is decidedly out of the line of American practice in car-building, and since the new standard cars of most roads are designed now to carry 60,000 lbs., it is safe to say that the additional capacity of such a car (20,000 lbs.) will hardly warrant the adoption of the third truck. A train of such cars with 80,000 to 100,000 lbs. distributed over a wheel base of less than 30 ft. must be a taxing load for the tracks and bridges of the average railroad, and though not so heavy as a train of locomotives, yet few roads would care to run trains of locomotives over their lines regularly. The car can hardly be looked upon as a rival to the standard eight-wheel gondola or hopper-botton coal car, and we shall hardly look for their general adoption, even for ore transportation. The car is interesting from its novelty and as illustrating the application of an intermediate support. It is submitted that the difficulties will increase with the length of the car, that the probable reason why no trouble has been experienced yet from the middle truck is that the car is short, 34 ft. It shows how the American clings to the idea of the truck, while Englishmen would adopt a pedestal support and one pair of wheels.

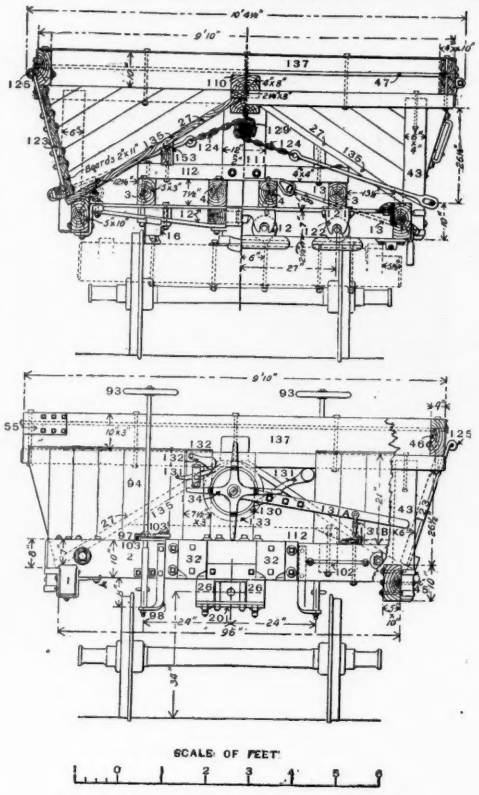


Fig. 3—Twelve-Wheel, Side-Dump Ore-Car.

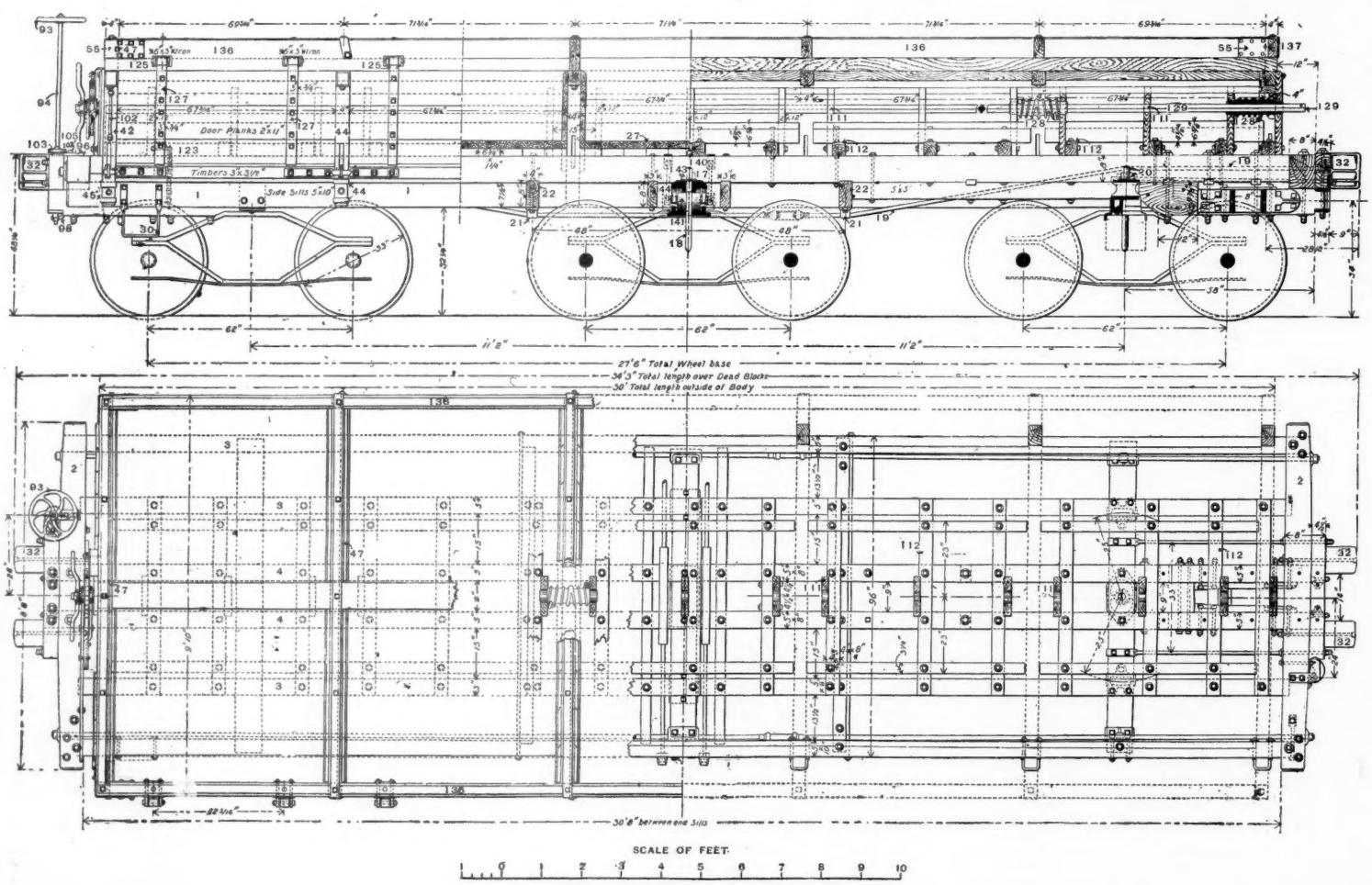
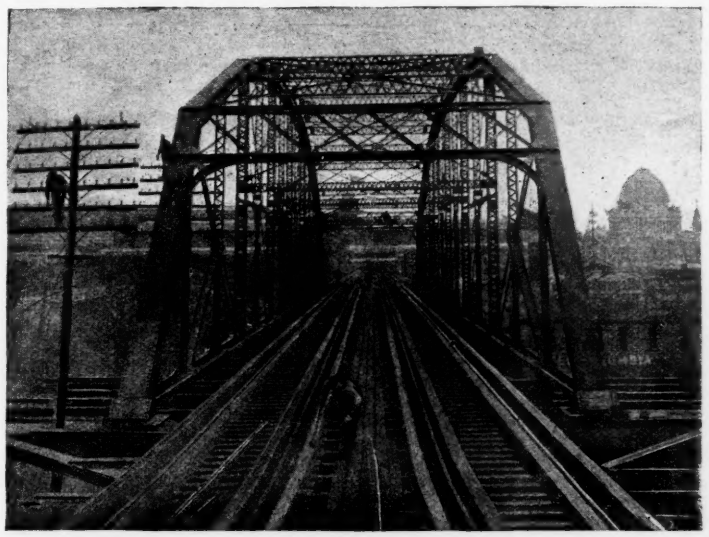

27'6" Total Wheel base
34'3" Total length over Dead Blocks
30' Total length outside of Body
30'8" between end Sills
SCALE OF FEET
0 1 2 3 4 5 6 7 8 9 10

Fig. 2—Twelve-Wheel, Side-Dump Ore-Car.

Double Track Bridge—Chicago & South-Side Rapid Transit Railroad.

This bridge is the longest span yet used in a city for elevated railroad purposes. Otherwise it is not exceptional, but it serves to illustrate a modern type of construction and also to show some of those points which demand special attention in a bridge for an elevated railroad.

The necessity for a bridge of so considerable a span arose from the fact that the Illinois Central with numerous tracks had to be crossed at Woodlawn station to obtain access to the World's Fair. Mr. R. I. Sloan, the Chief Engineer of the Chicago & South-Side Railroad and for a number of years Chief Engineer of the Manhattan Company in New York, located the terminal, and adopted the scheme of crossing the Illinois Central tracks, but the bridge itself was designed by Mr. Albert Lucius, C. E. of New York.



Madison Street Bridge, Chicago.

Chicago & South Side Rapid Transit Railroad.

The Elevated railroad at this point runs east and west along Sixty-third street, the elevated structure consisting of a series of deck bridges averaging 50 ft. span. The columns are placed at the curb line, and the street is spanned transversely by lattice girders, which in their turn carry longitudinal girders of the Warren type, on which is laid the track system.

The design of the Chicago Elevated structure, which was prepared by Mr. Sloan, has been fully illustrated in a former volume of the *Railroad Gazette*, but it may be interesting to give here the respective weights per lineal foot of this structure and some of those of New York, including girders, columns and bracing, but exclusive of track.

New York: Sixth avenue, pin-connected pony trusses, about 35 ft. span; double track, spanning horse car track, 800 lbs. per foot. Second avenue, Warren girder and lattice girder, double track, spanning horse car tracks, 1,200 lbs. per foot. Eighth avenue, lattice girder, double track, spanning horse car tracks, 1,000 lbs. per foot.

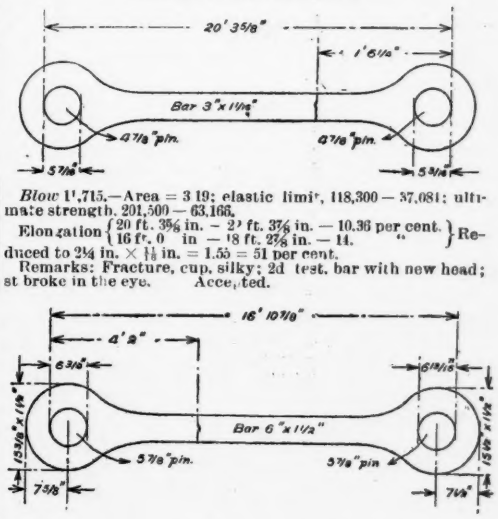
Chicago: Double track plate-girder structure on spread-top columns in a 25 ft. alley. D columns on curb line, weight 914 lbs. per foot. Three-track structure on Sixty-third street; columns on curb line about 48 ft. across and about 50 ft. apart longitudinally. Cross girders, lattice, with flat bar web members, depth 4 ft. 6 in. Longitudinal girders, Warren type, with drop ends resting on top of cross girders, depths varying from 3 ft. 6 in. to 4 ft. 6 in. Weight per lineal foot, 1,450 lbs.

In designing the abutment towers, it was necessary to provide not merely for heavy vertical loads, but also for a longitudinal thrust, the amount of which it was almost impossible to calculate. The limit of 14 ft. of headway had hitherto precluded the bracing of the columns at their feet, and it therefore became necessary to obtain longitudinal stiffness by means of bracing between the rails and the headway limit. Under ordinary circumstances this available depth is only that of the girders, and there is in addition a freedom of longitudinal movement arising from the necessity of providing connections at frequent intervals for expansion and contraction of the material. In the present case opportunity was afforded for additional longitudinal bracing by reason of the increased height of the structure, headway being required over the elevated tracks of the Illinois Central, making a total height of rails above street grade of 37 ft. The towers were accordingly braced both longitudinally, transversely and diagonally between the 14 ft. headway limit and the bottom of the girders, producing a massive appearance. That these abutments were not unnecessarily heavy is proved by the fact that the vibration common to all elevated roads is perceptible on one side of the bridge when a train is pulling up at a station on the further side. This fact, considering the weight of the bridge, has been a surprise to engineers and mechanics. This vibration is not merely a vertical undulation arising from the successive deflections of the girders under passing trains; it partakes very decidedly of the nature of a direct longitudinal thrust, produced when the air-brakes are applied.

The locomotives of the Chicago South-Side are 28-ton engines of the Baldwin compound type and sometimes haul trains of seven cars. Each car weighs about 21½ tons with a maximum load of 200 passengers; the total moving load amounts, therefore, at times, to about 150 tons. It is by no means unusual to see two or three trains following one another closely and all applying their brakes simultaneously, so that the aggregate amount of thrust may be very great. The footings of the columns are rigid, being closely fitted with rust joints into cast iron sockets, and the longitudinal vibration probably is due to the deflection of the columns combined with a slight movement of the girders at the slotted attachments.

The supporting towers of the bridge rest upon a timber grillage bolted to a nest of sixteen oak piles. The woodwork has been kept about a foot below the ordinary level of Lake Michigan, and is covered with a bed of Portland cement concrete. The plan first submitted was for a "spread foundation" similar to that used in the construction of the tall buildings of Chicago; but experience of the ground derived from the foundations of the ordinary structure led to the adoption of the piled foundation. The maximum pressure which will come upon one tower was calculated from the dead load of the bridge, the moving load of a train and a horizontal wind force of 450 lbs. per lineal foot of the structure.

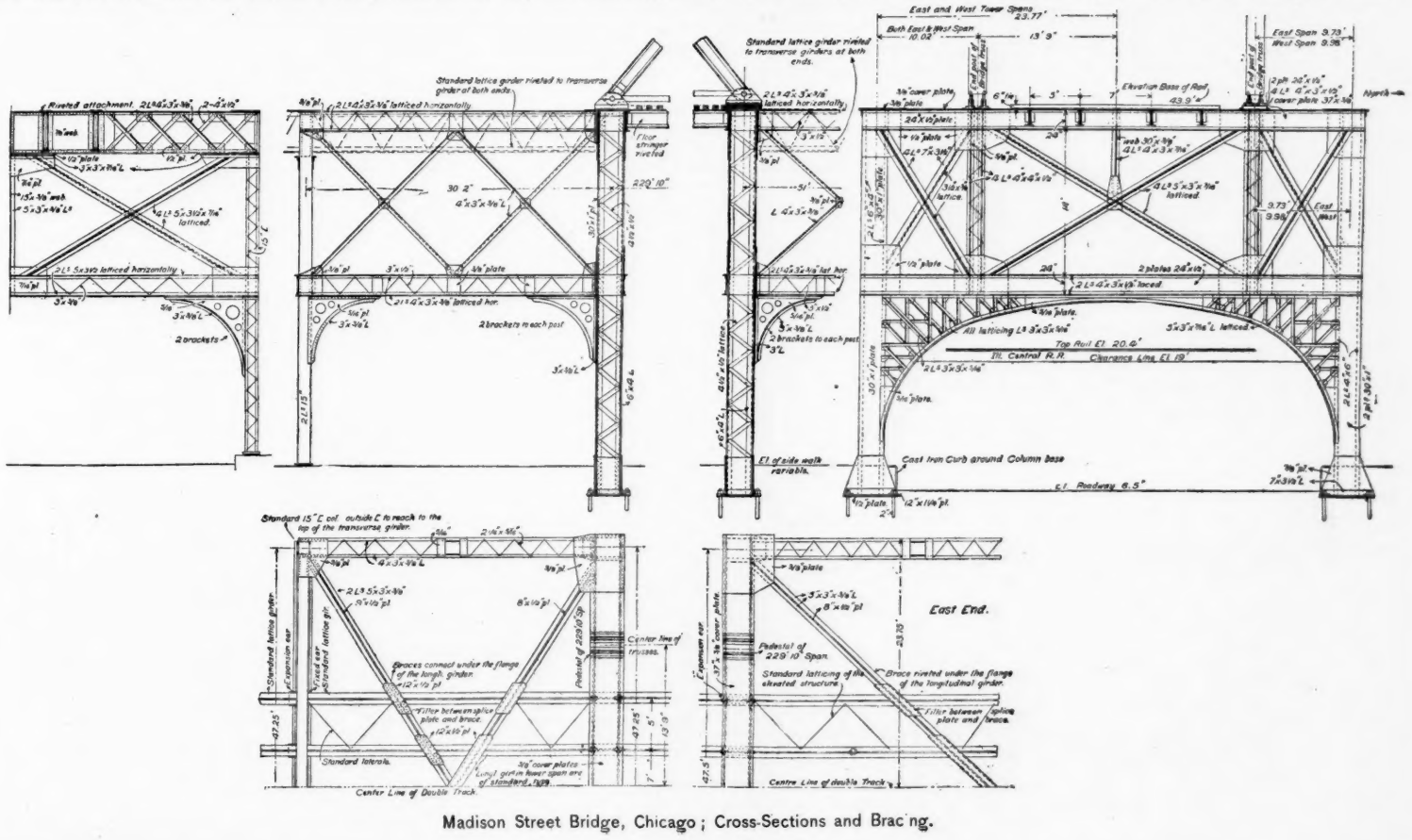
SAMPLE OF EYE-BAR TESTS.



Blow 11,715.—Area = 3.19; elastic limit, 118,300 — 37,081; ultimate strength, 201,500 — 63,165.
Elongation { 20 ft. 3⅝ in. — 2 ft. 3⅞ in. — 10.36 per cent. / 16 ft. 0 in — 18 ft. 2⅜ in. — 14. " } Reduced to 2¼ in. × 1⅛ in. = 1.55 = 51 per cent.
Remarks: Fracture, cup, silky; 2d test, bar with new head; st broke in the eye. Accepted.

Blow 261.—Area = 9.0; elastic limit 322,400 — 35,822; ultimate strength, 504,450 — 56,044.
Elongation { 1 ft. — 1 ft. 3¼ in. = 27.08 per cent. / 16 ft. — 2 ft. 9⅝ in. = 19.14 " } 16 ft. — 10⅞ in. — 2 ft. 11⅝ in. = 17.56 per cent. Reduced to 5⅞ in. × 1⅞ = 31 per cent.
Remarks: Fracture granulated; 2d test.... Rejected.

The maximum load on one foundation was about 170 tons, and the average supporting power of each grillage 960 tons. The concrete and brickwork were built during the coldest months of one of the severest winters experienced of late years in Chicago. The water was well salted and a pair of "salamanders" kept burning in the pit night and day, by which means the masonry was never permitted to freeze, although the thermometer was considerably below zero. An experiment was made at the same time upon frozen cement mortar to deter-


East and West Tower Spans 23.77'
Both East & West Span 10.02'
15' 9"
East Span 9.73'
West Span 9.96'
Elevation Base of Rail 43.9'
North
Riveted attachment. 2 L 4½ x 3½ x ⅝" 2-4½" ⊥
Standard lattice girder riveted to transverse girder at both ends.
Standard lattice girder riveted to transverse girders at both ends.
2 L 4½ x 3½ x ⅝" latticed horizontally
2 L 4 x 3 x ⅝" latticed horizontally
2 brackets to each post
Cast Iron Curb around Column base
Top Rail El. 20.0'
Ill. Central R.R. Clearance Line, El. 19'
El of side walk variable.
c.l. Roadway 6.5"
Standard 15" ⊏ col. outside ⊏ to reach to the top of the transverse girder.
East End.
Standard lattice girder.
Fixed end Standard lattice gir.
Expansion end
Braces connect under the flange of the longit. girder.
Filler between splice plate and brace.
Standard laterals.
Center line of trusses.
Pedestal of 229'10" Span.
Standard lattice girder of the elevated structure.
Brace riveted under the flange of the longitudinal girder.
Filler between splice plate and brace.
Center Line of Double Track.
Centre Line of double Track.

Madison Street Bridge, Chicago; Cross-Sections and Bracing.

TESTS OF STEEL FOR DOUBLE TRACK BRIDGE, CHICAGO & SOUTH SIDE RAPID TRANSIT RAILROAD COMPANY.

Tested at U. U. M. and L. U. M. and Brown & Co., R. I. Sloan, Chief Engineer.

Date of test.	Blow or cast No.	Analysis. Carb.	Phos.	Mang.	Test cut from.	Tested by.	Order No.	Original dimension.	Area.	Elastic limit. Pounds.	Pounds per sq. in.	Ultimate strength. Pounds.	Pounds per sq. in.	Elongation In 8 ins.	Per cent.	Reduction. Dimensions.	Area	Per cent.	Fracture of tensile test	Cold bending test.	Quench bending test.	Closing test. Full section.	Opening test. Full section.	Drift test.	Accepted or rejected.	Remarks.
2.7.93	17,360	.19	.011	.48	6×6 26	D. Fraser.	K.516	1.54×. 65	1.001	38,300	38.260	59,200	59,140	2.16	27.0	1.12× .410	.4592	54.1	½ cup.	180°	90°	90°	90°	100%	a	Brown & Co.
2.14.93	5,011	.18	.01?	.55	6×1½	D. Fraser.	K.516	1.50×.875	1.313	47,800	36,400	73,400	55,900	2. 5	31.2	1.065×.610	.6497	50.5	cup.	180°	180°	90°	90°	75%	a	
2.14.93	4,054	.19	.010	.57	6×1¾	D. Fraser.	K.516	1.76×.810	1.426	52,000	36,470	83,500	58,560	2. 5	31 2	1.760×.570	.7239	49.2	ang.	180°	180°	90°	90°	75%	a	

mine the extent to which frost would weaken it. The mortar was mixed in the proportion of two of sand to one of Portland cement, and allowed to remain frozen solid for two weeks. It was then thawed and found to have set, but to be about as friable as lime mortar after two or three weeks. It gained, however, rapidly in strength, and in two or three days became about as strong as mortar in Rosendale or Utica cement.

The columns supporting the towers were, by the term of the ordinance, placed like those of the ordinary structure at the curb line. The bridge, being a double track structure and not requiring the same width as that between the columns, was made to rest upon a transverse truss between the columns. The bridge trusses were placed 10 ft. away from the centres of the columns, which required very heavy bracing, in the transverse truss, but this was also beneficial in the stiffening of the whole structure. The columns and bracing are all of riveted work.

The dead load, as determined by the final design, is 266,000 lbs. per truss, or 19,000 lbs. on each panel. The live load consists of a train of locomotives weighing 56,000 lbs. each on a base of 30 ft. over all.

The material of the bridge was mild open-hearth steel. Test specimens were made from every heat. Eyebars were tested full size. A few of the tests are shown in the accompanying schedule. The bridge was built by the Keystone Bridge Co. The total weight of the bridge and supporting towers is 831,000 lbs. and the contract price erected complete was 3.6c. per pound.

The erection was carried on under difficulties, arising firstly from the overcrowded condition of the thoroughfare below, which is one of the main approaches to the World's Fair grounds, and, secondly, from the elevation of the tracks of the Illinois Central Railway, which was proceeding at the same time. No serious accidents occurred. One of the spans of the Illinois Central Railroad bridge was left unfinished until the bridge was swung to admit one of the bents of the falsework. The bridge was erected under sub-contract with the Keystone Co. by Messrs. Frank McCain & Brother, who have erected the whole of the elevated structure. The bridge was swung in four days from the completion of the falsework. The west end is on rollers, the east end is fixed.

International Electrical Congress at Chicago.

There appeared in our last issue a summary of the first two days' proceedings of the International Electrical Congress, held in Chicago the week beginning Aug. 21. In the reference made to the conclusions deduced from the experiments that were made by Mr. W. H. Preece, to determine whether it were possible to signal through space by means of electro-magnetic vibrations, an error made us say that "it was not much cheaper than to make direct metallic connection with the lightship or lighthouse and the land." The statement should have been, that, while it was found possible to signal by means of electro-magnetic vibrations for several miles, it was much cheaper to make direct metallic connection with the lightship or lighthouse and the land, and this latter was the means to be adopted by the English Government.

The discussion of the paper read on Tuesday by Dr. Silvanus P. Thompson on "Ocean Telephony," was taken up Wednesday, and was followed by a paper read by Dr. Stephen Lindeck, of Berlin, on "Materials for Wire Standards of Electrical Resistance," and a paper by A. F. Kennelly on a kindred topic, "Some Measurements of the Temperature Variation in the Electrical Resistance of a Sample of Copper."

The most interesting paper read before section C of the Congress on Wednesday was the one by Mr. L. B. Marks, of New York City, on "A New Incandescent Arc Light." In this new light the electrodes are not in contact; they are surrounded by an envelope made of highly refractory glass, which is insulated from the electrodes. This lamp glows like an incandescent lamp with the brilliancy of the arc light. The arc proper is scarcely visible, but the entire contents of the chamber seem to be luminous, giving the appearance of a solid cylinder of light. Mr. Marks was highly complimented for his original researches.

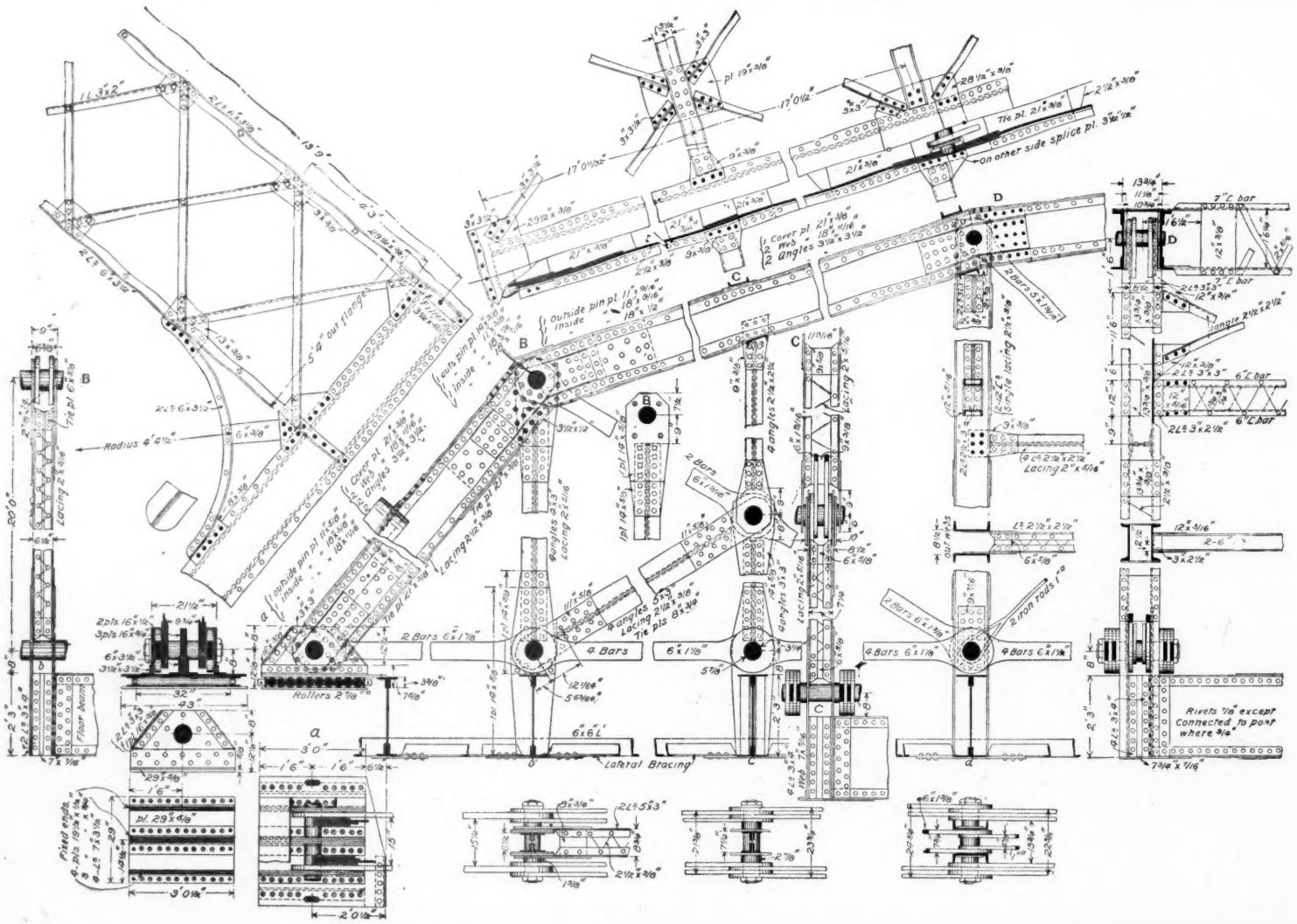
The principal topic of discussion at Thursday's meeting was that of long distance transmission of power. It was remarked during the discussion that those engineers who were not familiar with the difficulties of such transmission and the methods of surmounting them, were sparring with those of more experience to obtain some of their knowledge on the subject, which the latter seemed very reluctant to part with. Dr. S. P. Thompson stated that for distribution purposes all the complications of the multiphase system must be abandoned and the simple alternating current adopted. This seemed also to be the consensus of opinion among the leaders.

At the meeting held on Friday, the Chamber of Delegates presented its report recommending the formal adoption as legal units of electrical measure the following, after which the Congress was adjourned:

As the unit of resistance the international ohm, which is based upon the ohm equal to 10-9 units of resistance of the initial C. G. S. system of electro-magnetic units, and is represented by the resistance offered to an unvarying electric current of a column of mercury at the temperature of melting ice, 14-4521 grammes in mass, of a constant cross sectional area, and of a length of 106.3 centimeters.

As a unit of current the international ampère, which is $\frac{1}{10}$ of the unit of a current of the C G. S. system of electro-magnetic units, and which is represented sufficiently well for practical use by the unvarying current, which when passed through a solution of nitrate of silver in water in accordance with accompanying specifications, deposits silver at the rate of 0.001118 of a gramme per second.

As a unit of electro-motive force the international volt, which is the electro-motive force that, steadily applied to a conductor whose resistance is one international ohm, will produce a current of one international ampère, and which is represented sufficiently well for practical use by 1 000-1.434 of the electro-motive force between the poles or electrodes of the voltaic cell, known as Clark's cell, at a temperature of 15 deg. C., and prepared in the manner described in the accompanying specifications.


Radius 4' 4½"
Lateral Bracing
Rollers 2 7/8"
Rivets 7/8" except Connected to post where 3/4"
Floor beam
Pin of ends
Outside pin pl. 11"
Inside " 18"
Cover pl. 21"
Web angles 3½" x 3½"
Tie pl. 21" x 3/8"
Lacing 2½" x 3/8"
4 Bars
2 Bars 6" x 1 7/8"
6" x 6" L
2 iron rods 1"
Lacing 2" x 5/16"
Lacing 2½" x 2½"
Rivets 7/8" except Connected to post where 3/4"

MADISON STREET BRIDGE—CHICAGO & SOUTH SIDE RAPID TRANSIT RAILROAD.

As a unit of quantity the international coulomb, which is the quantity of electricity transferred by a current of one international ampère in one second.

As a unit of capacity the international farad, which is the capacity of a conductor charged to a potential of one international volt by one international coulomb of electricity.

As the unit of work the joule, which is 10-7 units of work in the C. G. S. system, and which is represented sufficiently well for practical use by the energy expended in one second by an international ampère in an international ohm.

As the unit of power the international watt, which is equal to 10-7 units of power in the C. G. S. system, and which is represented sufficiently well for practical use by the work done at the rate of one joule per second.

As the unit of induction the henry, which is the induction in a circuit when the electro-motive force induced in this circuit is one international volt, while the inducing current varies at the rate of one ampère per second.

The recommendation of the adoption of the foregoing standard units was the most important feature of the Congress. In the adoption of the name "henry" for the unit of induction America is honored, as the unit is so named for Prof. Joseph Henry, formerly of Princeton College and afterward Secretary of the Smithsonian Institution. Professor Henry was the first to observe the phenomenon for the measurement of which this unit is used.

It was much regretted that the papers read before the Electrical Congress had not been printed and sent out to members of the various electrical societies so that their members might have been better prepared to take part in the discussions. This was done in the case of the Mechanical, Civil and other engineering sections, and the discussions in these sections were much more spirited and interesting. The papers read before the Electrical Engineering sections will be collected and published in book form.

The Curtis Steam Trap.

The accompanying illustrations show a new form of valve which is now used with the Curtis Steam Trap.

As will be seen from the cut a neck large enough to admit the float is placed on one side of the trap. This nozzle is covered by a plate to which is bolted the composition valve. Should it be necessary for any reason to take out the float and valve, it may be done by removing the plate, which brings away with it the float and valve, so that it may be readily examined or repaired, but at the same time it leaves the pot in place and connected.

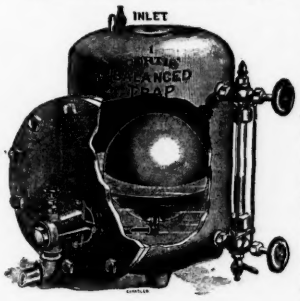


Fig. 1—Trap.

From the sectional view (fig. 2) it will be seen that the valve body is provided with ears by means of which it may be bolted to the cover of the trap.

The valve itself consists of a loose tube with water ring packing, resting on a Jenkins seat in the cap of the valve, and operating endways by the rise and fall of the float. The flow of the water, which passes through the tube, and out between the end of the tube and elastic seat, is cut off by the contact of the end of the tubular valve with the seat, while the water line in the trap is still some inches above the outlet. The valve holds tight even when the end is quite worn, owing to the fact that the seat is a Jenkins, and expansible. To remove the valve it is simply necessary to take out the small bolt in its center and draw out the valve with a hook. This valve may be easily turned up in any lathe in a few moments, the Jenkins seat renewed and the valve made practically new without starting a gasket, bolt or pipe. In order that the water may be drained off when the discharge valve is closed, and work continued, the trap is provided with an independent passage or pass-by, controlled by a stop valve.

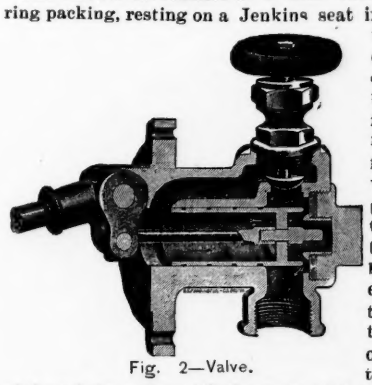


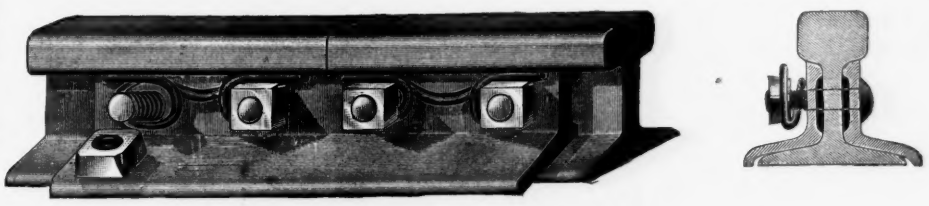
Fig. 2—Valve.

The float is made by an original process in which the ball is constantly rotated while the copper is electrically deposited, thus securing uniform thickness. It is large, perfectly spherical, hardened by the rolling process so that it is hermetically sealed, and will remain tight at a pressure of 200 lbs. Each trap is provided with a glass water gauge. The traps will work against any head pressure less than the direct pressure in the trap.

The trap is often used in large plants as a water line trap when there is necessity of balancing any particular circulation, thereby preventing snapping and cracking in pipes and radiators. This may be accomplished by connecting to the top of the trap the direct steam pipe and bringing the return below the water line of the trap.

The "Positive" Nut Lock.

The new nut lock which is shown in the engravings is made and sold by the Buffalo Nut Lock Company, Buffalo, N. Y. It is made of spring steel, oil tempered, and the company claims for it superior efficiency in that the lock not only acts against the back of the nut but also partially incloses it. It is claimed also that the spring being round in section, the friction against the angle plate is reduced, allowing freer vibration to the spring. The company is getting out a single nut lock for places where the double lock is not applicable and offers to send samples on request if the distances between centres of bolts and the sizes of bolts are given. This nut lock is patented.


The "Positive" Nut Lock.

Collision at Long Island City.

On Saturday night, Aug. 26, about 11:47 o'clock, a passenger train from Manhattan Beach on the Long Island Railroad was run into at the rear by a following passenger train from Rockaway Beach, near Haberman's factory, about two miles east of Long Island City, N. Y., and the wreck was a very bad one; 10 passengers were killed outright, 6 have since died, and 22 were injured. The Rockaway train was running at high speed, probably 40 miles an hour or faster, and the rear car of the foremost train was split open. This train had five cars. There were no injuries to persons in the Rockaway train.

Reliable witnesses say that there was no fog at the time of the collision, although the newspapers all report that the atmosphere was very foggy. Probably there was fog at some localities or altitudes and not at others. This part of the road is operated under the block system. The Manhattan train had been stopped at the signal near Haberman's factory on account of the presence of a train in the next section and had just started along when the collision occurred, the hind car being struck when it was about 100 ft. short of the signal; that is, it would have cleared this block after running 100 ft. further. It does not appear how long this train was delayed; one account says that it had broken in two; but it seems to be settled that either when the train parted or when it stopped for the signal the rear brakeman went back with a red light, but had been called in when the train started. The tower from which this signal is operated is around a curve, beyond the signal, and the operator has not a good view of a train standing at or passing the signal, there being a hill between him and the signal. From the reports it would seem that the operator here, after giving the clear signal for the Manhattan train, and *assuming* that it had passed out of the block or would soon pass out, gave permission to the tower in the rear, Bushwick Junction, about three-quarters of a mile back, to admit the Rockaway train.

Butting Collision at Towners, N. Y.

On Aug. 26, at 12:35 p. m., there was a butting collision of passenger trains on the New York Central & Hudson River near Towners, N. Y., in which two engineers, two firemen and one passenger were killed, and two trainmen and five passengers were injured. Both trains were running at high speed. A telegraphic order given to train No. 13 (going north) fixed the meeting point as *Ice Pond* when it should have read Dykemans. The dispatcher says that the message was correctly sent and that the station operator in repeating it wrote Dykemans.

Foreign Railroad Notes.

The Russian government has made a large appropriation for the construction of a railroad from Moulta Kara on the Trans-Caspian Railroad, to Knasnovousk. The terminus at Ouzoun-Ada will be abandoned.

The South-Eastern Railway, of England, has been authorized by Parliament to lend money to employees to assist them in purchasing dwelling houses. The rate of interest is to be four per cent., and the fees in each case must not exceed two guineas, exclusive of stamp duty.

The Chairman of the Directory of the Main & Neckar Railroad, Privy Councillor Lichthammer, celebrated the close of his fiftieth year of railroad service on May 29 last. All of this service was on the Main & Neckar Railroad, and all in the department of construction and operation.

We gave an account some time ago of Russian through freight rates, which showed that where a route was made up of several different railroads, those with a small mileage in the route received a proportion of the through rate much in excess of their proportion of the mileage. This provision has now been changed for the *pro rata* principle; but for grain and coal, which are the principal long distance freights, the old method continues in force for the first 70 versts (46 miles) of the route.

The Emperor Ferdinand Northern Railroad of Austria, which, on pressure from the Government, adopted the Keuzer Zone tariff of the State railroads, had, in 1892, 38 per cent. more travel than in 1890, the last entire year of the old tariff; but its passenger earnings were somewhat less than then.

On the lines of the Southwestern Railroad of Russia, the covered freight cars are having their capacity increased as rapidly as possible from 600 to 750 poods (21,600 to 27,000 lbs.), following the example of the Prussian railroads some two years ago. The larger portion of the stock has already been changed.

The equipment of the Bulgarian State railroads at the end of 1892, according to recently published statistics, consisted of 41 locomotives, 117 passenger cars and 928 mail, baggage and freight cars. The total number of passengers carried during the year amounted to 288,304, while the freight amounted to 287,127 tons.

The Prussian State Railroad administration deputed its directory in Erfurt to make experiments with heated freight cars for winter and refrigerator cars for summer. It reports that there is little demand for such cars. During the time of the trial only about 158 tons were shipped in refrigerator cars, chiefly wine and champagne, in a few cases beer, mineral water, spirits, vinegar, fresh meat and vegetables. The heated cars dispatched from three Rhenish stations to Berlin weekly frequently were entirely empty.

It appears that American railroads are not the only ones which sometimes take the liberty of ignoring a plain mandate of the law. A collision recently occurred at Darlington, England, on the North-Eastern Railway, and General Hutchinson, in his report on the case, says that "the road has been habitually disobeying the order of the Board of Trade, issued in January, 1891," requiring the piece of road in question to be operated under the block system. There are some large stations in England where the railroad companies strenuously claim that for short distances the operation of the absolute block system is impracticable, while the Board of Trade Inspectors insist that the system *can* be operated.

According to the *Centralblatt der Bauverwaltung*, the customary plan on German railroads of having the conductors examine and collect the tickets on the train, always more or less dangerous, considering that they must pass along the outsides of the cars on footboards, is shortly to be abolished on the Prussian state lines The whole business of ticket inspection and collection is to be done at the stations, and accordingly the use of station platforms and waiting rooms is to be reserved entirely for passengers. All other persons are to be excluded from them unless they provide themselves with a special ticket which is to be issued for that purpose It is expected that the number of necessary train men can be reduced.

In reply to a question the commercial manager of the Hungarian State Railroads recently said that the management continued to be perfectly satisfied with the workings of the zone tariff. In 1892, with nearly the same mileage of roads there was an increase of about $450,000 in passenger earnings, and of about one-eighth in the number of passengers carried, all of which increase was made as early as August, as later, in consequence of the cholera, and still later by interruptions to traffic, travel fell off. The increase extended pretty evenly over all the zones and to short and long journeys. So far this year there has been a further increase over 1892. As the expenses have not increased nearly as much as the earnings, and as there has been a considerable increase in freight earnings, in part attributed to the facilitation of business travel, and as the country has been satisfied, there is no reason and there has been no intention to change, to advance or to abolish this zone tariff.

Inspection of Railroads in Illinois.

Chairman Coutrell and Commissioner Lape, of the State Board of Railroad and Warehouse Commissioners, together with R. P. and D. C. Morgan, Consulting Engineers of the Board, have just finished a three-weeks inspection of the roads in the southern portion of the state, and of lines running from Chicago to St. Louis. Their inspection extends to depots and other buildings, rolling stock, bridges and trestles, as well as track and roadbed; and they report the roads as a rule in excellent condition. Stops were made at all bridges and frequently along the line. About three weeks more will be consumed in the inspection of the roads in the northern and northwestern part of the state.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The Chicago General Managers' Association is apparently coming to be a body of considerable importance. It took vigorous, united and effective action when a strike of switchmen seemed impending a few months ago, and the movement for a series of conferences to discuss the pressing questions incident to the present season of short earnings seems to be well supported. The meeting last week took no definite action on the subjects before it, but a committee was appointed to work up interest in the objects of the Association throughout the country, and the men named upon it are Aldace F. Walker, John Newell (Lake Shore & Michigan Southern), E. T. Jeffery (Denver & Rio Grande), J. T. Odell (Baltimore & Ohio), and H. S. Haines (Savannah, Florida & Western). It is hoped to get Associations formed at other cities. The placing of Colonel Haines on the committee probably indicates that the work which it is proposed to do will be kept in line with and subordinate to that of the American Railway Association, of which he is President. It is to be hoped that such is the case, for the subjects thus far discussed by the General Managers are of the same character as those which the American Railway Association deals with. The questions which have been broached at Chicago—the proper methods of dealing with employees, the reform of car service evils, the reduction of expenses of outside agencies and the regulation of wages—are in line with what the American Railway Association has done in the past, and come within the scope of what it aims to do in the future. In fact, the province of the "Time Convention" is the consideration of any subject coming within an operating manager's duties. The matter of wages is one which an association of this kind will probably never settle, but it may perhaps harmonize and unify ideas to a useful degree. How to deal with employees on matters other than the rates of pay is a delicate and complicated question which needs discussion, and while we are not sanguine of revolutionary results from the new associations they ought to do something valuable. The action of the last meeting of the American Railway Association in directing the Executive Committee to investigate the whole subject of the conditions to be taken into account in dealing with the several classes of employees, would seem to be in the line of progress, and that committee may probably be aided by the work of district associations. Local meetings of General Managers ought to be a means of much good in preparing members to go to a national meeting ready to act. The reforms suggested by the Chicago men are not peculiar to the present financial status; they will need to be discussed a good many times before they become accomplished facts.

Standard Rail Sections.

The long promised series of standard rail sections compiled by a committee of the American Society of Civil Engineers appointed more than three years ago for that purpose has at last made its appearance. While we have occasionally poked a little mild fun at the Committee for its grand and massive deliberation, we have always recognized the difficulties of the situation and have been by no means impatient that the proposed standards should be brought forward. In fact we have discouraged haste, for what seemed to be practical reasons, and as we said three weeks ago in commenting on this same matter, the delay has been really productive of good. That is, the report comes now, not as a merely speculative document or as a theoretical outgiving of radical philosophers, but it comes with the backing of a large body of scientific opinion and of considerable actual practice. The work done in the metal by several members of the Committee, and the actual work of other engineers more or less closely identified with the Committee in their notions of correct sections, have produced concrete examples of what the Committee recommends; and a good many tons of rails having the great essential characteristics of these sections are now in the track. So, while three years and a half ago these sections would have been looked on as experimental, they will now command the respect always given to positive experience. The work of the Committee, like most of the really valuable work done by mankind, comes as a summary and expression of human experience, and indeed as a compromise among the members of the Committee themselves. That is not to say that it is not also an advance on average practice and really educational, for it is all of this; but the rough edge of the educational process has been taken off. Probably some crudities have been polished off the notions of the Committee themselves and certainly railmakers and rail users stand in a very different attitude toward rail sections of this general type from that which they occupied only a short time ago.

We have said that the series now presented is a compromise among the members themselves. One of the most striking illustrations of this is the matter of the upper corner radius, which, as now recommended, is $\frac{5}{16}$ of an inch. The reader who has available the progress report presented by the Committee some 32 months ago (see *Railroad Gazette*, Feb. 20, 1891) will notice that all but two of the committeemen at that time recommended an upper corner radius of $\frac{1}{4}$ of an inch. He will also remember, probably, that this was the radius employed by Captain Hunt in the series proposed by him more than four years ago (see *Railroad Gazette*, June 7, 1889), which series has undoubtedly already made a considerable impression on rail mill practice. The $\frac{1}{4}$-in. radius was also used by Mr. P. H. Dudley in the series designed and patented by him three years or more ago (see *Railroad Gazette*, Aug. 15, 1890), on the lines of which many tons of rails have since been rolled. Nevertheless, the Committee recommends an upper corner radius of $\frac{5}{16}$ of an inch. This is not because of any change of opinion on the part of the members of the Committee, but is simply a compromise to get the members who were decidedly of the opinion that a longer radius should be used to agree to certain other features of the proposed sections. Inasmuch as the compromise was on a matter of pure theory and involved no question of morals, it seems to have been a most judicious one. We regret that the $\frac{1}{4}$-in. radius did not prevail, but question if it is a matter of very serious consequence.

The recommendation for greatest width of head is also a compromise in which a minority of the Committee prevails. The width now recommended for the 100-lb. rail is $2\frac{3}{4}$ in. In the preliminary sections presented by the individual members of the Committee, in the progress report referred to above, three members were in favor of $2\frac{7}{8}$ in. for the heaviest section and four members favored a width greater than $2\frac{3}{4}$ but less than $2\frac{7}{8}$; that is, there were seven in favor of a greater width than that now recommended. Two recommended $2\frac{3}{4}$ in., and two a less width. We are prepared to accept this compromise also as a wise one, not being at all clear as to the balance of advantages one way or the other, although we are inclined to think that the greater width would have been better. The rule of diminution of the width from the heavier to the lighter sections, as recommended by the individual committeemen in their preliminary sections, and the rule adopted in the final report, are rather obscure. It will be observed that the width diminishes by $\frac{1}{16}$ in. for each 5 lbs. weight from 100 lbs. down to 80 inclusive. From 80 the diminution is $\frac{1}{32}$ in. down to include the 60-lb. section, and below that the width diminishes by $\frac{1}{4}$.

The radius finally recommended for the top of the crown, namely, 12 in., is the same as that recommended by all of the members in the preliminary sections.

The recommendation that the height of the rail shall be the same as the width of the base agrees substantially with the preliminary sections. There were two members who in that report recommended a rather low rail; that is, $\frac{1}{2}$ in. less in height than in width of base, with a comparatively heavy and deep head. There were also two members who recommended that the height could be greater than the width of base for very heavy sections; otherwise, all recommended the proportion that has now been adopted. For present practice this is probably wise, but we are inclined to believe that ultimately the element of a broad bearing of the rail itself on the tie will be of less importance than it is now and that then the relative height of the section will be increased in order to get greater stiffness with a given weight of metal.

The fishing angle now recommended is 13 degrees. This again is a compromise. In the preliminary sections two members of the Committee recommended a smaller angle than this, five recommended a greater angle and four recommended an even 13 degrees.

The distribution of weight as finally adopted is not an exact average of that recommended in the preliminary report. It puts a very little more metal in the head and a little less in the flange, but on the whole it appears to be excellent. An inspection of the preliminary sections will show that there were five members of the Committee who were in favor of heavier heads, and some of them were in favor of heads a good deal heavier than now recommended. In this particular the compromise sections are better than we had hoped for, considering the weight of the opinion in favor of heavier heads.

Finally, the great points attained by the Committee are those for which we have been contending for a good while, namely, that the rail should have a broad head relatively to its depth, the sides of the head should be vertical and that the metal should be so distributed throughout the section that the head should contain but little more than the flange. This last element in the design is without doubt the really important one; the other elements are insignificant by comparison, even if important in themselves. The essential part of the job was to get a rail that would roll well, that would cool well, and in which the metal in the head would be well worked. Such a section seems to have been designed. It now remains to see how widely it will be adopted and whether or not a large experience with it in the track will confirm the theories of those who have fought for it so long and so strenuously.

The Long Island Collision.

The disastrous collision on the Long Island road last Saturday night, which is reported in another column, was probably almost entirely due to the misconduct of the signalman at the point where the collision occurred, though it is impossible to get accurate statements of all the facts until the public hearing before the Coroner and the State Railroad Commissioners takes place.

The block section was less than a mile in length and the second train was running fast, so that the question as to how long the first train was delayed in getting started out of the block after the clear signal was given to it, will probably be of very little practical interest

The responsibility of the engineman for not seeing the tail lights on the car is an important secondary question. He was turning to the left, but by looking out of the fireman's side he could have seen the train several hundred feet before reaching it, and except for a few small straggling trees, which by no means made a complete barrier, he could have seen it about 1,000 ft. away. He will have a partial excuse, however, in the fact that the fixed signal, for which he would naturally be looking, was about 40 ft. high; as he drew near to it this would draw his eye away from the tail lights. The circumstance also affords an interesting commentary on the fact that many bull's-eye lights which give a splendid signal in a line parallel with the length of the car give a very small light, if they give any at all, at an angle of 15 or 20 degrees with that line. A common red lantern can be seen in all directions with equal facility.

The absurdity of flagging as a protection where trains are frequent is here again illustrated. The flagman went back, but was called in. Evidently the delay had not been long enough to require the torpedo rule to be carried out. Even if it had, what sort of success could any one expect in carrying out such a rule where trains were following each other within four minutes or less and where detentions were liable to occur every mile?

It is probably safe to assume that the engineman of

the Rockaway train made no mistake at the entrance to the fatal block section. If the signal there had been against him and he had disregarded it the fact would have come out. He was making good time and this signal was at a junction where he would most likely be alert. It is possible that the signalman at Bushwick junction gave a clear signal before he received authority from the outgoing end of the block, but the indications point the other way.

Coming now to the main question, most American experts will say that the lesson of this disaster is to use the automatic track circuit signals, as the Pennsylvania, the Illinois Central, the Chicago & Northwestern, the Boston & Albany and other roads are doing, or to use Sykes locks, as the New York Central and the New York, New Haven & Hartford are doing. This is, without doubt, the plainest lesson in the premises, and if the Long Island road has no better answer to make for itself than that which has appeared in the New York papers, it will be its duty to either adopt such a safeguard or to run fewer and slower trains. But it is to be remembered that the Pennsylvania road for 15 years, and the great English roads for 30 years, have used practically the same system that the Long Island uses, and have shown high records of safety with it. In view of this the whole question of discipline comes up: the age and experience of the signalmen, the methods of testing their fidelity to the small details of their duties, and of testing enginemen on similar matters. The signalman near Haberman's factory had a somewhat unusual temptation to trust to guess-work, as a train could clear his signal some time before he could make sure of the fact; but the company knew this, of course, and should have been all the more strict in holding him to the regulations.

The newspaper criticism of the management of the company is very sharp, owing largely to the occurrence of this disaster so soon after that at Parkville (June 20), and the gossips report that the superintendent will be retired on account of incompetency. These comments are all in the air. One paper lays the whole blame upon the engineer of the Rockaway train, apparently for no tangible reason but that he ran fast. Others simply declaim without any definite aim. The superintendent very likely is less blameworthy than some other officers, or than some predecessor of him or of them. Faults of discipline and general policy often take months to correct. This crit icism has a value, however; it voices a public demand that the railroad commissioners make a very thorough examination of the entire discipline of the road, as respects the train service, with a view to showing just what kind of men make these blunders and whether they are the best men obtainable.

The Material for Car Couplers.

Our old acquaintance, "Steel Coupler," is still unhappy, because we will not say, in some way, that the Chicago and Altoona coupler tests "knocked out" malleable iron as material for car couplers. We are sorry not to be able to please him, but we really cannot reason out any such result of the tests. For the reader who is curious to go over the discussion in full, we give the references to the issues of the *Railroad Gazette* containing the earlier editorials, and "Steel Coupler's" first letter: June 23, p. 460; July 21, p. 539; July 28, p. 569. Another letter from "Steel Coupler" appears in this issue. In brief, his first contention is about this:

(a.) It is wrong to draw conclusions about material when the couplers into which the material is put are of different designs. All the couplers of one material might be so faulty in design that a good material would give a bad test.

It is equally true that a comparison of couplers is only just when the material in all the couplers is identical. If both these statements be accepted, then nothing was shown by the tests except that certain couplers when made of a certain steel will stand the test, while other couplers made of other materials will not stand the test. All this is a true statement of fact. There was no fair test of designs *per se*, or of materials *per se*, and none was intended or attempted. What was sought was a knowledge of the value of the proposed tests and whether couplers could be made to meet those tests. No attempt was made to select the strongest or most suitable design.

The proof of "Steel Coupler's" statement of the differences in the results of tests that may come from differences in design can be found from the tests of his own coupler. In both the Chicago and the Altoona tests the Drexel coupler was made of steel furnished by the Solid Steel Company, of Alliance, O. In the Chicago test one of the Drexel couplers broke at the first blow at 15 ft., the other at the second blow at 15 ft., and neither stood the test. At Altoona, the average number of blows required to break the Drexel coupler was 8¼. The average of the American, the California and the United States, also made by the Solid Steel Company, was 13.7 blows. The average for all the couplers made by the Solid Steel Company was 10½ blows. The average for the Chicago couplers made by the Chicago Tire & Spring Company was 17¼ blows. Probably these differences are largely due to the design, but we repeat here that the tests were never intended to compare either designs or material, but were intended to furnish data sufficient for a decision regarding the real justice of the proposed M. C. B. tests.

(b.) The *Railroad Gazette* probably intended to say that special brands of malleable iron are better than the poorest brands of cast steel, but this is unfair, unless it is stated at the same time that very few couplers of the two poorer brands are offered for sale.

Nothing has been brought out to show that the *Railroad Gazette* was wrong in the statement that the best grades of malleable iron are vastly better than the average cast steel. No one will dispute this who is unbiased and has a knowledge of the characteristics of cast steel as it has been made for couplers up to this time. We are perfectly willing to grant, as our correspondent evidently wishes, that the Solid Steel Co., of Alliance, O., did in the Altoona tests furnish the majority of all steel couplers tested, and that these couplers all stood the test, except one. But in the Chicago test the couplers made by the Solid Steel Co. did not stand as well as the best malleable iron couplers. The two Drexel couplers failed, the one California coupler failed, but the American, an entirely new coupler, which had never been tested before (made by the Solid Steel Co.), did not fail. This shows a lack of uniformity of material and helps to prove that the average steel casting is very uncertain material for couplers, and that the best cast steel exceeds greatly in strength the best malleable iron when used for couplers. In justice it should also be said that none of the couplers made by the Chicago Tire & Spring Co. have failed in any of the tests.

The statement that very few couplers of the two poorer brands are offered for sale is idle, as undoubtedly each maker is offering his entire output. If our correspondent means that the majority of couplers in use are of two brands, he is correct. The Chicago Tire & Spring Company leads in this with the Chicago coupler. The Solid Steel Company comes next with a great variety of couplers. We have not referred merely to the two poorer brands, but to all brands taken together. We have not taken into consideration solely the four manufacturers who took part in the test, but have included, practically, the entire steel casting trade of the United States, of which trade we have a rather wide knowledge.

In all this it must not be forgotten that there was sufficient time after the Chicago test to improve the material being put into couplers, and we know in one case at least, and have considerable evidence about other cases, where the material was radically changed and differently treated after the Chicago test showed the inadequacy of the ordinary run of steel castings.

(c.) The *Railroad Gazette's* statement is made on the assumption that those who arranged the proposed M. C. B. tests stopped just at the proper line, but no such wisdom was displayed. It was only by chance that the line was not drawn so as to exclude the two special brands of malleable iron.

This is unfair to the M. C. B. committee, and is a conclusion made without investigation. The tests were proposed after a large number of preliminary tests made in at least a half dozen different places and after free and full discussion with coupler makers. The value of such argument we fail to see.

(d.) The tenor of the *Railroad Gazette's* statement is that if malleable iron in its best form exceeds the requirements of the M. C. B. tests, why pay more for steel?

The *Railroad Gazette* has not taken this ground, but after some deliberation it would appear that it is a fair question to ask, all things being considered. Malleable iron couplers of the best material have been sold below $18 per car with profit to the manufacturer. No sales have come to our knowledge of steel couplers for less than $22 per car. Some sales at lower prices may have been made, but we believe only for some special purpose. Bearing this in mind, why is it not a fair question to ask whether it is worth while to pay from $3 to $5 per car more for steel couplers than for malleable iron couplers that will more than meet the requirements of the Master Car Builders' Association. We do not think that anything we have said will deter any railroad company from purchasing good steel couplers at a reasonable price, neither will it encourage the sale of poor steel couplers or give an excuse for the purchase of poor malleable iron couplers; and what we have said is a true statement of the facts in the case and we sincerely hope that it does justice to all concerned.

Compound Locomotives in England.

In the discussion of the report on compound locomotives at the last convention of the Master Mechanics' Association Mr. Joughins, of the Norfolk & Southern, said that at Crewe he was surprised to find that they had not built a single compound for eight months except the one now on exhibition at Chicago. He then went to the North-Eastern and was still more surprised to find that they were building 20 locomotives for passenger service, all simple, and had abandoned the compound for that service. Crewe, as every one knows, is the mechanical headquarters of the London & North-Western, Mr. Webb's citadel, and every one knows also that the North-Eastern is Mr. Worsdell's territory.

Incidentally, we have heard from various sources of an experiment on the Great Eastern which may give a clue to the later action on the North-Eastern. When Mr. Worsdell went from the Great Eastern to the North-Eastern he left 11 compounds, 16 and 26 × 24 in. cylinders, and another was built afterwards. The story is that one of those engines was tried two years ago against two simple engines, one 16 × 24 and one 17½ × 24, the compound and the 16 × 24, having 175 lbs. boiler pressure and the 17½ × 24, 140 lbs. All were run in identical work for 17 weeks; then the crews were changed and they were run 17 weeks more. The distance of the round trip was 166½ miles and the load was 245 tons one way and 424 the other. The result, as we understand, was, coal consumption per train-mile, 37.25 lbs. for the compound and 35.75 and 36.06 for the simple engines. The consequence has been the conversion of all the compounds to simple engines. This was on the Great Eastern; but Mr. Joughin's statement that no more compounds will be built on the London & North-Western and on the North-Eastern is precisely what we have heard from other sources.

To those who are interested in the development of the compound locomotive and who have been active in introducing them, this step in England will perhaps be discouraging; but it should be remembered that the service on English roads is not the kind that is particularly favorable for compounds; that is, the simple engines are worked with such good economy and with so little forcing of the fires, burning, say, 65 lbs. of coal per square foot of grate per hour, that the compound has nothing like the opportunity to show saving that it has in this country, where the engines are worked with less economy and the boilers are forced to a degree not known elsewhere, namely, from 120 to 200 lbs per square foot of grate per hour. It is evident that where so little coal is burned on the grate in a given time as in England, the smokebox temperature will be much lower than where the boilers are forced as they are here, and a low smokebox temperature may lead to losses in the receiver. Also, it is well understood that the conditions of locomotive design are such that the smaller savings ordinarily obtained in stationary engine work cannot be obtained to an equal degree in compound locomotives; and besides there are losses incidental to the steam distribution by a link motion on a locomotive which offset the saving which would otherwise be obtained, and it is quite easy to find conditions of locomotive operation where the work is so light and the cutoff so advantageous in the cylinders of the single expansion engine that a compound would not be advisable as no saving could be made. This will appear from an examination of indicator cards when locomotives, simple and compound, are doing the same work, the work being very light in proportion to the engine.

We have repeatedly said that the saving shown by compound locomotives will depend upon the service and upon how hard the single expansion engines work. The harder the service and the more overworked is the single expansion engine, the greater will be the saving shown by a well-designed compound, and it would not be at all surprising to find that in England, where the work is very light, there should be no saving by compounding. When the boilers are not forced more than they were in the tests on the Great Eastern, there is no possibility of gaining an incidental saving common with compounds in heavy service and which results from the better action of the blast on the fires and the reduction of the total amount of fuel burned on the grate in a given time. The experience on the Great Eastern and the North-Eastern of England has been corroborated in this country by tests made under similar conditions, and the conclusion to be drawn is not that compounds are less economical than simple engines, but that the saving by componnding is dependent upon the conditions of operation.

At the meeting of the Mechanical Section of the World's Engineering Congress held in Chicago last July, Mr. A. von Borries read a historical paper on the "De-

velopment of the Compound Locomotive," in which he does not give sufficient credit to American engineers in the part they have taken in the development of the compound locomotive. Mr. Von Borries opens his paper by telling how Roentgen, in 1834; John Nicholson, in 1847; Ebenezer Kemp, in 1860; M. Jules Morandieres, in 1866, and William Dawes, in 1872, had each patented, or published descriptions of, proposed compound or "semi"-compound locomotives. This brings the paper to 1874, when Mallet first became engaged in adapting the compound system to locomotives. Had Mr. Von Borries stated that his paper dealt with the European development of the compound locomotive, there would have been no reason for supplementing his statements; but as Mr. Von Borries gives his paper a general title and then confines it to the work done along this line in Europe and Great Britain, it seems important to present something of the American side of the question. It is true that from about 1874 to within the last two or three years greater progress was made in the use of compound locomotives in Europe than in America, but we question if Mallet's compound was "the first real compound locomotive which proved successful in ordinary service," or whether Mr. Mallet, as himself has claimed, was "the first to construct locomotives on the compound principle." To Mr. Mallet belongs all the credit possible for his labors in introducing the compound locomotive, despite the fact that several had been in operation years before. As early as 1852 two "semi"-compound locomotives, built after the designs of John Nicholson, were running on the Eastern Counties, now the Great Eastern, Railway of England, and were kept in operation for several years. The next compound, according to our records, and, so far as we know, the first in America, was an Erie locomotive that was sent to the Shepard Iron Works, now the King Iron Works, of Buffalo, to be equipped with compound cylinders. The cylinders were 11½ in. and 24 in. in diameter and 26 in. stroke, arranged tandem and with separate slide valves to regulate the steam to each cylinder. The high pressure cylinder was in front and its valve was operated by a rod connected with the valve rod of the low-pressure valve; so both valves were operated by the same eccentrics and link. The record shows that the engine was converted to a compound in 1868, and the records in the offices of the Erie road contain one item, under date of June, 1870, referring to the smaller piston having been renewed. From this it is evident that the locomotive was operated for some time. Together with this we have the evidence of those men who operated the engine as runners and firemen. The great objection to the locomotive at the time, as recalled by those who operated it, was that it did not steam freely. It will be observed that the low-pressure cylinder was about 4.3 times larger than the high-pressure cylinder, which is quite different from the present practice of having the ratio of cylinders about 2 to 1. An illustration of this locomotive taken from the original drawings, and a description, were given in the *Railroad Gazette*, Sept. 19, 1890. The history of this compound locomotive seems to be sufficiently authentic to have been included in the historical review of Mr. Von Borries.

The general severity of the reduction in railroad earnings is indicated by the fact that a number of conservative managers who at first refrained from reducing wages are now, one by one, compelled to make reductions. The Maine Central reduced the pay of all officers and employees 10 per cent., beginning Aug. 19. The New York & New England has ordered a similar reduction beginning Sept. 1, excepting, however, employees receiving $30 or less a month. Both companies promise to restore the old rates as soon as possible. The Pittsburgh & Western has discharged about 200 men from the shops at Allegheny City. The shops of the Pittsburgh, Fort Wayne & Chicago, at Fort Wayne, are working only five hours a day. The Cleveland & Pittsburgh has discharged some of its men and closed a few night telegraph offices. The Lake Erie & Western has put its shops on half time, half of the men working the first three days of each week and the other half the last three. The East Tennessee, Virginia & Georgia will reduce the pay of all its men Sept. 1. The Cleveland, Cincinnati, Chicago & St. Louis and the Burlington & Missouri River have closed a number of night telegraph offices. The Nashville, Chattanooga & St. Louis will reduce wages 10 per cent. Sept. 1, and the General Manager of the Union Pacific states that probably a reduction of that amount will be ordered on that road. The Wabash has ordered a reduction of 10 per cent. on all salaries of $100 a month or over, beginning Sept. 1. The St. Louis Southwestern will make reductions as follows: Men receiving below $75 per month, 8 per cent.; those between $75 and $100, 10 per cent.; those over $100 per month, 15 per cent. This reduction applies only to salaried employees. The Seattle, Lake Shore & Eastern has made a reduction of 10 per cent. on all salaries from $1,200 to $2,000. Those above the latter figure are reduced 12½ per cent. A despatch from Pine Bluff, Ark., states that the shops of the St. Louis Southwestern at that place have resumed work with 500 men, the full force, and it is said that the Wagner car shops at East Buffalo, N. Y., which have been running only four days a week, will at once be put on full time with 500 men. An officer of the Pennsylvania Company denies the report that the number of brakemen has been reduced either on passenger or freight trains.

It appears that the Brotherhood of Locomotive Engineers acknowledges a moral responsibility, if not a legal one, for the boycott which it attempted against the Toledo, Ann Arbor & North Michigan road last spring, as it is announced in a press dispatch from Toledo that Mr. Arthur has paid the costs, amounting to $6,000, of the suit brought against him by the Ann Arbor road for $300,000 damages, and the suit has been dismissed. It will be remembered that the Brotherhood engineers on the Lake Shore & Michigan Southern tried to divert freight from the Ann Arbor road, against which they had a grievance, and that one of them was fined for refusing to handle cars going to the Ann Arbor road. The regulations of the Brotherhood are such that the Chief (Mr. Arthur) could virtually approve of such a boycott without taking any positive official action, and it was thought that the suit would be defended on this technical ground; but the outcome proves otherwise, and it is, as claimed by the road's attorney, a decided victory over the boycotters.

NEW PUBLICATIONS.

The Railways of Great Britain.—Under the above title, a pamphlet is published, being the report of Mr. Charles Hansel to the Railroad and Warehouse Commission of the State of Illinois. It is a brief review of the growth and condition of the English railroads, covering permanent way and equipment especially.

Transactions of the American Institute of Mining Engineers, Vol. XXI. February, 1892 to 1893. Dr. R. W. Raymond, Secretary, New York City.—This volume contains the proceedings of the Baltimore, Lake Champlain, Schuylkill Valley and Montreal meetings. Of course there are a good many papers of value in the one thousand or more pages, but we remember none of very special interest. As usual, the volume has an admirable index.

Proceedings of the American Railway Master Mechanics' Association. Twenty-sixth Annual Convention, June, 1893. Angus Sinclair, Secretary, Temple Court, New York City.

This report appears promptly and is well printed. The subject matter is so recent that it is hardly necessary to specify any of the reports contained. Perhaps the reports and discussions of most interest are those on Tests of Locomotives and on the Compound Locomotive; but the topical discussions are valuable, as are some of the other reports.

The Journal of the Franklin Institute for August contains the conclusion of Mr. Jaques' very elaborate lecture on Heavy Ordnance in the United States. This was delivered before the Franklin Institute last January, and the publication of it was begun in the July issue of the journal. It is a review of the development of modern heavy artillery manufactured in the United States. The same number contains the conclusion of Mr. Tesla's lecture of February on Light and other High Frequency Phenomena; also the continuation of a lecture by Mr. J. W. Richards, of Lehigh University, on the Specific Heat of Metals.

The World's Railway. J. G. Pangborn, Exposition Executive World's Railway, World's Columbian Exposition, Chicago, Ill.

Major Pangborn, who has been the principal organizer of the magnificent showing made by the Baltimore & Ohio Railroad at the World's Fair, announces as in preparation a subscription volume having the above title, the purpose of which is to give a summary in book form of that great collection. The collection embraces over 2,700 examples, showing the evolution and development of the railroads of the world, and the volume will contain more than 275 pages. The divisions will be motive power, equipment, permanent way, bridges and appliances; the arrangement of each being chronological. The volume will be a chronology of the evolution and development of railroads and will also be a means of reference for those who wish to study particulars. The circular promises that the book shall be printed on fine paper and altogether a thoroughly first class job, with no advertising matter. The edition printed will be only sufficient to fill the subscription list, and the subscription price will be $5.00. Those who are interested in securing this valuable work should write at once to Major Pangborn.

TRADE CATALOGUES.

Coal-Handling Machinery. The C. W. Hunt Co., 45 Broadway, New York City.

We have received from this enterprising house three recent illustrated catalogues showing a variety of ingenious and well designed machinery for handling coal, iron ore and similar materials. The catalogues show conveyors, hoisting engines, the Hunt elevator and automatic railroad and all the details necessary for the thorough equipment of the hoisting and conveying plan. The Hunt system of industrial railroads is also illustrated.

Jamaica at the Columbian Exposition.—An excellent little pamphlet has been compiled under the direction of Lt.-Col. the Hon. C. J. Ward, C. M. G., honorary commissioner for Jamaica, giving a description of the colony of Jamaica, with historical and other appendices. It is designed for free distribution at the World's Fair and is a really useful handbook of the colony, although printed in an unfortunate form for the comfort of the reader. That is, the pages being a good deal wider than they are long and the type not divided into columns, the eye must follow across a line 7¾ ins. long, which anybody who tries it will find to be a serious discomfort.

Railroad Matters in Chicago.

Freight Traffic.—The railroads leading to Chicago from the agricultural sections of the West, North and Southwest, while hauling less than their customary volume of freight for the close of summer, are making fair gains on recent business. The deliveries here the past week aggregated 4,853,000 bushels of grain against 3,520,000 the week immediately preceding. There was, however, a shrinkage of 1,435,000 bushels from the week ending Aug. 27, 1892. The entire loss was on wheat, the receipts of which were unusually small, being only 356,000, compared with 2,512,000 bushels the corresponding time in 1892. The flour movement also showed a considerable falling off, but it was more than compensated for by the increase in miscellaneous farm products, the combined gain on these two classes of freight being 7,608 tons over the same week last year. The live stock traffic was not only larger than the preceding week, but showed an increase of 2,300 cars over the week ending Aug. 27 last year.

The receipts of flour and grain at Chicago by 12 leading Western roads for the week ending Aug. 26 and corresponding time in 1892, and amount delivered by each road, compare as follows:

By—	1893.		1892.	
	Flour.	Grain.	Flour.	Grain.
	Bbls.	Buso.	Bbls.	Bush.
C. N. W.	12,479	522,000	13,232	665,000
Ill. Cent.	450	935,000	1,250	1,021,000
C., R. I. & P.	8,514	959,000	4,125	833,000
C., B. & Q.	6,860	1,305,000	21,357	1,344,000
C. & Alton	11,100	299,000	13,350	476,000
C. & E. Ill.	600	294,000	147	378,000
C., M. & St. P.	14,700	303,000	20,250	509,000
Wabash	450	289,000	8 100	249,000
C. & G. W.	16,495	169,000	20,908	269,000
A., T. & S. Fe	873	161,000	101	383,000
Wis. Cent.	713	....	1,200	1,000
L., N. A. & C.	564	17 000	.....	100,000
Totals	74,498	4,853,000	104,020	6,228,000

The fact that the Chicago, Burlington & Quincy showed so well in the grain movement was due to its heavy delivery of corn and oats.

The outward movement of merchandise and other freight, although much larger than any preceding week since the early summer, was moderate compared with the same time a year ago, but the jobbing trade in all descriptions of merchandise seems to be undergoing a material expansion.

Passenger Traffic.—The past week doubtless brought the largest number of railroad passengers that ever came to Chicago in an equal length of time. The World's Fair register of admissions, which is considered the best measure of volume of visitors here, shows a paid admittance for the six days ending Aug. 26, of 982,317, being an increase 200,145 over the previous week, but while the volume of passenger traffic since Aug. 1 exhibits a material gain over June business, the earnings of the present month will not be in proportion. General Manager Merrill, of the C., B. & Q. system, said: "Our passenger earnings the current month are still behind June receipts for an equal number of days, and I see nothing to justify predictions that the final showing will be any more satisfactory." The President of another road said: "The roads are all doing a large passenger business, but the final account will show very small net results. There is, however, no probability that the roads will again advance rates until after the close of the Fair." Referring to harvest excursions, which have been so popular with farmers in recent years, the general passenger agent of one of the large lines traversing the most densely settled section of Illinois, Iowa and Northern Missouri said: "The prospects for harvest excursions are poor. One of our traveling agents has just returned from an extended trip taken exclusively to ascertain the prospects. He reports that the scarcity of money will materially reduce such business. That points which in former years made up parties of 100 to 200 are not likely to furnish more than 10 to 25 excursionists this year. Peoria has usually given us about 800 excursionists, and other leading points in Central Illinois 600 to 700, but Peoria only promises about 100 and the shrinkage will be equally severe at other large towns. These excursions were usually composed of farmers who were on the lookout for cheap lands in the West and Northwest. At present, however, very few have money to invest in that way, and the harvest excursion business will not be sufficient to compensate the railroads for preparing for it." A passenger official of the Burlington gave an equally discouraging account of the outlook for such business from points along his lines in Illinois. General Manager St. John, of the Chicago, Rock Island & Pacific, said: "Our passenger earnings are increasing and for the third week in August they showed a gain of $58,433 over the corresponding time in 1892. Unfortunately, however, they were more than offset by a shrinkage in freight receipts, which decreased $105,520. This apparently leaves a net

deficit of $47,087. But the current operating expenses are less than a year ago and may partly, at least, compensate the decrease. The outlook for business is also more encouraging than at any time the past two months, and while we are not likely to catch up with the very heavy traffic during September and October, 1892, the economy being practiced in all departments on our line may enable us to present a much better showing of net earnings than seemed possible a few weeks back." General Manager Eveling, of the Chicago, Milwaukee & St. Paul, said, "Both passenger and freight traffic on our line show some improvement."

CHICAGO, Aug. 28.

The Resistance of Cars on Curves.

One of the Bulletins of the International Commission of the Railroad Congress contains a paper of great length on the question of the resistance due to railroad curves, giving results of recent elaborate French experiments, concerning which we have previously published some fragmentary notes. The abstract of the paper which follows is by no means complete, but gives the principal results obtained. The report is accompanied by diagrams taken on the special track laid for the purpose of carrying out the experiments. These experiments were made under the direction of a special commission appointed by the Minister of Public Works, and were made in 1892, and were not completed at the time of the report made to the St. Petersburg Congress.

At the previous session of the Congress, held in Paris, 1889, the question of the passages of curves was offered in this form: "What are the means which experience would seem to indicate as the most efficacious for facilitating the passage of rolling stock over curves?" In the early examination into this subject, made by M. de Pambour, he tried to gather information relative to the total resistances of locomotive engines and cars; but he limited himself to theoretical considerations when it came to the resistance of curves. In some experiments made upon the lines of the Eastern railroad, of France, it was found that with passenger trains of from 8 to 20 cars, running at a speed of from 22 to 31 miles an hour, over curves of 2,625 ft. radius, and above, the influence of the curve is not appreciable. When they have reached 35 miles an hour, there is a sensible increase of resistance amounting to about 5 per cent. With freight trains it is convenient to add to the unit of resistance 2.2 lbs. per ton on curves of 3,281 ft. radius, and 3.3 lbs. per ton on curves of 2,625 ft. radius. The influence appears especially due to the length of the curve. These coefficients are applicable to trains whose average running speed is considerably below the speed for which the elevation of the outside rail has been calculated. In some experiments made at different times on the Paris-Orleans Railroad, the following formula was obtained:

$$C = 1{,}000 \frac{V}{R^2} n$$

in which C is the additional resistance of the train in kilograms per ton; R, the radius of curvature in meters; V, the speed in kilometers per hour; n, the number of ordinary four-wheeled cars in the train. The figures given by this formula should be added to the normal resistance of the train under consideration. Thus, for a train of 30 cars running over a curve of 1,148 ft. radius, at a speed of 12½ miles per hour, the increase of resistance would be about 11 lbs. per ton, that is to say, a little above the actual rolling resistance of the train; it may also be said, perhaps, that this supplement is equivalent to the influence of a grade of .5 per cent. The length of the curve is supposed to be greater than that of the train. More recent experiments seem to indicate that the numbers given by the application of the above formula are a little too high for curves of a short radius, that is to say, curves less than 656 ft. Mr. Fetter, engineer in charge of the rolling stock of the Departmental Roads, of France, made some comparative tests of the resistance of two types of locomotives on curves for a narrow gauge line where the gauge was one meter, or 3.28 ft. One of these engines was of the combined duplex Mallet type, with four cylinders; the other was of the four-axle type with three axles coupled and a trailing truck axle behind. It was taken for granted that if upon a continuous grade, an engine running by gravity had acquired a certain speed, and that this speed was maintained at a certain point of cut-off, the engine running first upon a straight line and afterward upon a curve, then the diminution of speed upon the curve would indicate the resistance offered by the curve. These speeds were carefully maintaind by a portable tachymeter counting seconds. On a grade of .24 per cent. the diminution of speed on a curve of 984 ft. radius was nothing for a Mallet locomotive hauling loads varying from 19 to 81 tons. Hence the conclusion was reached that on a track of one meter gauge, with cars having two axles and a wheel base of 8.2 ft., the resistance due to such a curve is at least negligable when compared with a grade of .24 per cent.

Further examinations were made in 1891 by the State Railroad Administration of Saxony on the line from Chemnitz to Annaberg, where the radii of the curves sometimes dropped as low as 558 ft. The rolling stock used consisted of five cars with two axles, each having a wheel base of 19¾ ft., and two cars with three axles having a total wheel base of 23 ft. The whole seven cars were provided with radial arrangements which it was possible to make them rigid at will. With such a train it was found that the effect of a curve of 558 ft. radius was very apparent, as it doubled the initial resistance in the case of radial axles and this resistance was increased 135 per cent. with rigid axles, and the increase was about one-half less for curves of 928 ft. radius.

The belief has gradually been established that super-elevation facilitates the passage over a curve when it is quite the contrary. There is also an evident confusion regarding widening of the gauge on curves. The adoption of the super-elevation is a measure of security, to prevent the overturning tendency due to centrifugal forces. Nevertheless, for a long time the super-elevation has been regulated by the maximum speeds at which trains were to be run; but for very lower speeds the cars are forcibly drawn against the inside rail and the resistance is increased, either because the inside flange touches the rail or the conicity of the tire acts in the wrong direction, so that the largest circle of contact between the wheel and the rail is on the inside rail. This has been demonstrated on lines where the number of freight trains exceed the number of passenger trains; so that the rule most frequently observed to-day is to adopt a figure intermediate between what really belongs for the high-speed trains and that appropriate for the slow.

The experiments undertaken in France give some very interesting information upon this subject, and seem to establish one point very clearly, and that is, that all super-elevation ought to be absolutely banished from depot and switching tracks, freight yards, sidings, wharves, terminals and, in a word, in a general way from all parts of the line where the speed is necessarily low.

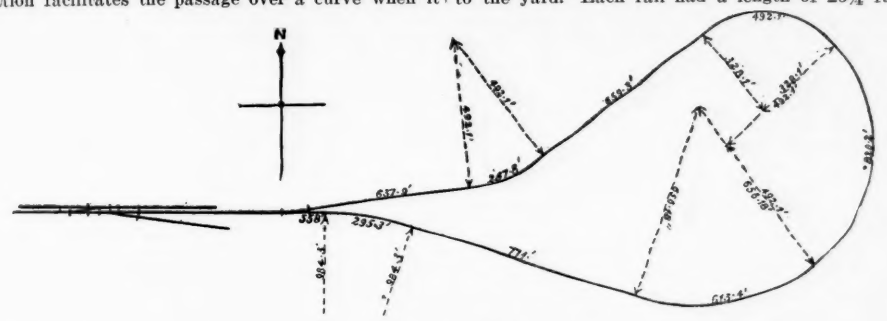
The widening of the gauge has a very limited application on French railroads which have a standard play of .4 in. The effect of the widening of the gauge is to increase the obliquity which the cars can take relatively to the centre line of the track, and consequently to increase the angle of contact between the flange and the rail.

The resistance to the passage of rolling stock on straight lines and curves, depends upon a mass of elements which vary independently of all control and in spite of every effort on the part of the observer. Among these elements are the intensity of the wind and humidity or dryness of the atmosphere. Finally, traction dynamometers are not readily adapted to this purpose, as they do not give the resistance of the engine. The pull which they register, and which may be read direct, does not give exact indications, and must be corrected by taking into consideration the variation in speeds, etc. The French commission has attempted to go further and it has at least reached a point where it can do away with certain unknown quantities, smooth out the ground and indicate the way in which observations and experiments can be profitably carried on in the future.

The measuring instrument used is the pendulum dynamometer. It is composed of a pendulum, the inclination of which to a vertical scale measures the positive or negative acceleration of the car to which it is attached; that is to say, it is the resultant of the forces which act upon the car. The pendulum, in its motion, traces a sinuous line upon a paper, which is unrolled by a clock motion. When the pendulum is placed upon a car, the latter is pushed out over the track by means of an initial impulse; the ordinates of the line traced by the pendulum are at each instant proportional to the resistances which are exerted against the car. Their variation at the time of entrance of a curve indicates the increase of resistance due to the curve; and this applies equally as well to a train of cars hauled by an engine, or to an engine alone moving under the action of a motor effort which is maintained as constant as possible. The apparatus has the further advantage of being portable. It may be transferred from one car to another and be set up in any position, where it will make an immediate measurement without necessitating any calculations whatever. It thus permits a rapid account to be taken of all the variations to which the car is subjected, and to follow all the phases of the phenomena which are produced; to examine at once into the causes and, consequently, to rationally direct the experiments according to the results obtained in each instance.

Two series of investigation served as the basis of the work of the Commission. The first comprised the experiments and examinations made outside of its own immediate jurisdiction, accounts of which were given to its members. The second comprises the experiments made under its own direction.

The special experimental track which was used for the tests was built at Noisy-le-Sec upon a large level plain prepared for the construction of workshops. The track was laid in the form given by the plan of fig. 1. It was laid with Vignole rails weighing 60 lbs. to the yard. Each rail had a length of 26¼ ft. and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passage of the curves; sometimes it was done by hauling the trains with a dynamometer car; sometimes, by adding to the line of cars thus hauled a dead engine, thus increasing the resistance, this resistance being measured by means of a second dynamometer.

It has been found that when an isolated car travels over a curved track under the action of an initial impulse, or of some motor effort, it always takes, except in very exceptional cases, a well determined direction relative to the rails. The outside wheel of the front axle bears against the outside rail with its flange. The axle tends to incline from its normal position relatively to the car as much as the play which is given it, and the means of drawing it back into its proper position will permit. This incline is taken in such a way as to give the inside wheel as much an advance as possible. It tends to deviate the axle from the radial position. At the back, the inside wheel just touches the inside rail, its flange and the axle tend to incline in the same direction as the front axle, still giving the inside wheel as great an advance as possible, and inversely to what takes place to the forward axle this inclination tends to bring it to a radial position.

Thus the movement of a car upon a curved track is brought about by the composition of two other movements; one, in consequence of which the centre of gravity of the car describes a circumference around the centre of the curve, the other in consequence of which the vehicle turns around its own centre in such a way as to make a complete revolution about itself during the time in which it is describing a complete circumference. This rotative motion can only be accomplished by forces outside of the car itself; that is to say, from the effort exerted by the rails against the flanges of the wheels. There must, then, be a lateral action of the rails against the flanges. This simple consideration is sufficient to explain the oblique position of the car. Again, the lateral action of the outside rail upon the outside front wheel cannot be brought about without giving place to supplementary frictional resistances which tend to retard the wheel in its movement and to accentuate its tendency toward obliquity to the axle and consequently to the car itself.

If the conicity of the tread is not sufficient to compensate for the difference of distance traveled by two wheels, new frictional resistances result, tending to advance the inside wheel.

The same thing occurs for the rear axle. The conicity of the tires intervenes in inverse direction to that which is required in order to compensate for the inequality of the distance traveled by the two wheels, so that there is necessarily an accentuated tendency to advance the inside wheel. The same thing really occurs within narrower limits for the intermediate axles, if there are any; these different axles form a coupled resistance to oppose the rotative motion of the car, and tend to hold it in a position which is oblique relatively to the rail.

The centrifugal force which acts against the centre of the gravity of the car tends to make it turn around the point of contact of the outside front wheel against the rail and acts solely against the outside rail. It has for one arm of its leverage the distance from the centre of gravity to the front axle. The weight due to the elevation of the rail acts in an opposite direction with the same leverage. Finally, the horizontal action of the inside rail upon the inside back wheel prevents the obliquity from exceeding a certain limit. Its arm of the lever is the wheel base. The horizontal reaction of the outside rail against the outside front wheel is equal to the algebraic sum of the three other forces.

Experience shows that when the outside rail is not elevated, and when the centrifugal force acts with all its intensity, this force, combined with the horizontal reaction of the outside rail upon the front wheel, almost suffices, but not quite, to overcome the resistant couple, and the horizontal action of the inside rail upon the inside back wheel is very slight; on the other hand, it ought to become stronger in proportion as the outside rail is elevated and the action of the centrifugal force is reduced by that of the weight. This has been found to be the case.

The action of the inside rail works against an arm of a lever almost double that against which the centrifugal force and weight act. By diminishing the resultant of these two last forces the action of the inside rail against the back axle is increased, but the action of the outside rail against the front axle is reduced in still greater proportions, and diminishes the sum of the lateral efforts exercised by the rails against the flanges. If we suppose the resistant couple to be constant, the minimum of this sum is found at the time where the action of the weight due to the super-elevation of the rail exactly counterbalances the centrifugal force.

It is very well known that this can exist only when the movement is normal and regular. If for any reason an engine or car running over a curve takes a swaying motion, other elements intervene and the theory does not apply. These premises being laid down, it is easy to determine at what points the supplementary resistances felt by the cars running over a curve arise, and what are the circumstances which can vary them. The supplementary resistances on a curve can arise from two causes:

1. The friction of the flanges against the rails.
2. The supplementary friction of the boxes against the axles, especially that due to the play of the brasses against the collars of the axles.

We may add the resistances of the air to the movement of a car on a pivot, but as this movement is somewhat slow, it does not seem possible that the air can have any appreciable effect. The friction of the flanges against the rails depends, first, on the pressure which is exercised between the surface in contact, then the character of the contact, due to the outlines of the rails and the flanges, and the greater or less obliquity which the wheel assumes relatively to the rail.

The supplementary friction of the axle against the boxes results from the action and reactions which are exerted between the axle and the bearings in consequence of the transmission of the different efforts which we have explained. They depend on the conditions of the frictional surfaces and their state of lubrication, as well as on the intensity of the efforts which produce them. These efforts are about the same as those which cause the friction of the rail against the flanges. The supplementary friction of the axles against the journal bearings varies in the same way as the friction between the rails and the flanges, and for the same reasons.

Suppose, now, a car with two axles is pushed over a track on to a curve that has no elevation of the outside rail. Suppose, also, that the axles have only the minimum amount of play in their boxes, and the latter are located in the same way relatively to the pedestals; that the flanges were without any conicity, and that the faces of the flanges are against the rail both horizontally and vertically.

The car will take, on the curve in question, as oblique a position as the play on the track will permit. The front outside wheel will touch the rail by the front edge of its flange, which will carry the vertical pressure of the car by way of the axle and its flange, which will support the horizontal pressure exercised by the rail. The contact against the pedestal will necessarily take place in a line with the axis of the axle, and, thanks to the obliquity of the wheel against the rail, the contact of the flange will be well in advance. The outside rail and the flange of the outside front wheel will then be worn away most rapidly.

The action on the rear axle is a little different. From what has been said it will be seen that this axle tends to approach the radial position. The friction which is produced against the side of one or the other of the flanges tends to accentuate the resistant couple, but the resistance due to the friction of the flange against the rail tends, on the other hand, to readjust the vehicle and to come to the assistance of the motor couple. The effect of a horizontal action of the inside back wheel against the inside rail is therefore less injurious than that which is produced against the outside front wheel and the outside rail. Experience shows that this action is always slight.

Finally, a car such as we have been supposing in running over a curve, ought to feel a considerable resistance and experience considerable wear both on flanges and rails. Furthermore, as this resistance is due in the great part to the frictional resistances, every circumstance tending to vary the coefficient of friction will have a very great effect upon this resistance, and ought to show, from one constant to another, great variations according to the variations due to the hydrometric condition of the atmosphere and the rail.

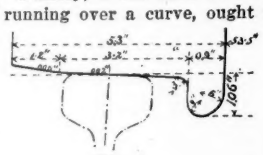

Fig. 2.

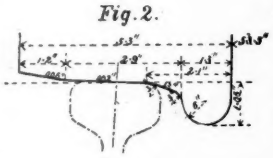

Fig. 3.

Fig. 4.

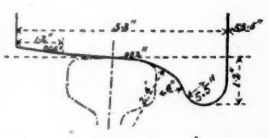

Fig. 5.

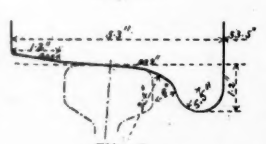

Fig. 6.

This is just what was observed at Noisy, in the experiments made upon a brake van whose tires had been turned with a vertical face (fig. 2) to the flange.

The elevation given to the outside rail will lessen these resistances a little without changing the speed. This form of flange is essentially defective. Not only from the standpoint of resistance on the curve and wear, but also from that of safety; for the friction of the flange against the rail tends to raise the front wheel over the rail and thus facilitates derailment. It is a case sometimes met, but when a tire shows by its wear that it has a tendency to approach this form of flange, it ought to be removed at once, especially when it is on cars which are compelled to run over lines having curves of short radius.

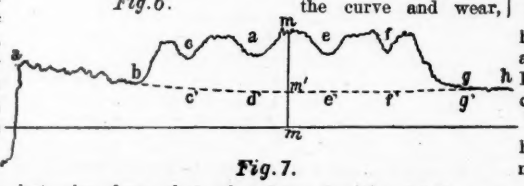

Fig. 7.

Suppose now a car placed under the same conditions as before, having flanges turned to a standard outline like those of the Eastern Railroad Co., whose rolling stock was used at Noisy. The outline of the rail becomes a matter of serious importance. If the curve connecting the top and the side of the head is of a short radius, approaching squareness, and, owing to the obliquity of the front wheel, the contact of the wheel and the rail is some distance ahead of the instantaneous axis of rotation, considerable friction will be produced which will cause a very great resistance and will tend to wear away this edge.

This is exactly what occurred in the experiments at Drouet as well as those at Noisy. At Noisy, more especially the rails had already been used on the main lines and their upper surface was worn so that they presented corners somewhat accentuated. The corner of the outside rail was at first subjected, in these tests, to a very great wear; and, after a few runs, a trace of filings and even chips were found on the ballast; but, when the profile of the rail had reached such a condition that it approached on its wearing portions the outline of the tread the wear was very much diminished. The friction, however, still caused considerable resistance which required a great deal of work to overcome.

Some experiments made with tires furnished with markers leaving marks upon the rail tended to demonstrate that, with tires of standard outline and a rail whose profile had thus been rectified by wear, the rolling of the front axle on curves so adjusted itself that it acted like the rolling of the inside wheel against the rail.

The coning of the tread and the inclination given to the face of the flange has the effect of sensibly bringing the instantaneous axis nearer, both in a vertical and horizontal direction, to the points of contact of the two surfaces.

On the rear axle the coning tends to increase the friction against the flat portions of the tread and the resistant couple. It therefore has an injurious effect. The inclination given to the face of the flange has, on the other hand, the effect of reducing the friction due to the horizontal action which is exercised between the inside wheel and the rail. It therefore tends to reduce the resistance and wear.

[TO BE CONTINUED.]

TECHNICAL.

Manufacturing and Business.

A. & P. Roberts & Co., of Pencoyd Iron Works, of Philadelphia, have leased the plant of the Riverside Bridge and Iron Works, at Paterson, N. J., and will continue the works in operation.

The Audible Electric Block Signal Co., of Camden, N. J., has been formed for the manufacture of railroad signals. S. T. Kerr, E. H. Cornell, S. Harper, of Philadelphia, and L. Z. Noble, of Camden, are stockholders.

W. T. Agerton has been appointed Receiver of the Lima Steel Casting Company.

The Pittsburgh Reduction Company has moved its office to the Ferguson Building, Pittsburgh, room 701.

The firm of J. A. Ware & Co., of St. Louis, large railroad contractors, has been incorporated in Missouri under the title of the J. A. Ware Construction Co., of St. Louis.

The Brown & Sharpe Manufacturing Co., of Providence, R. I., started up its foundry on Aug. 14, after the usual summer's vacation, and in all the departments of the machine shops operations were resumed on Aug. 28.

Edward W. Eldridge was, on Aug. 21, appointed Receiver of the Q. & C. Co., of Chicago, manufacturing various railroad specialties. The application for Receiver was made by W. L. Findley, President, C. F. Quincy, Treasurer, and other Directors of the company. The liabilities are reported to be about $114,000. The Receiver will continue the business of the company without interruption.

The firm of Eppinger & Russell, wholesale dealers and manufacturers of lumber at 66 Broad street, New York, and at Olustee, Fla., with creosoting works at Long Island City, made an assignment recently to Louis Adler. The firm is one of the heaviest operators in yellow pine and creosoting in the United States and has owing to it over $100,000 by corporations. Owing to the slow collections it has been short of ready money and this caused the assignment.

Receiver William Shaw, of the Gilbert Car Company, has been given possession of the plant of the company at Green Island, Troy, N. Y. The Receivers of the Troy Iron & Steel Works have been granted permission to complete contracts which amount to $75,000.

The National Tube Works Co., of McKeesport, Pa., has put its plant in partial operation. The wages of the men were reduced from 7½ to 15 per cent.

The prospects at the works of the Youngstown Bridge

Co. are now brighter than they were a short time ago. The company has plenty of orders ahead, but has had some difficulty in obtaining iron. Several carloads of iron were received several days ago and more is expected, so that it is thought the works will be kept in full operation.

The foundry and machine shops of the Eureka Cast Steel Co., at Chester, Pa., have been destroyed by fire. The company will rebuild at once as a number of pressing orders are now being filled.

"Pantasote," which is now used by a considerable number of important railroads as a substitute for car upholstering, has been used in place of leather on the new United States ship "Monterey," and the builders of the vessel, the Union Iron Works, of San Francisco, have found the material so satisfactory that it has been decided to use it for the furniture of the United States ship "Olympia," now building at the San Francisco yard.

New Stations and Shops.

The new plant to be built at Toledo, O., for the Vulcan Iron Works will comprise a machine shop, two stories, 250 × 105 ft.; engine and boiler house, 30 × 65 ft. The buildings are to be of steel construction, with iron truss roofs, and the plans are now being prepared.

The Union Pacific is reported to have decided to build a 17-stall roundhouse at Starbuck, Wash.

Power Transmission by Electricity.

The latest long-distance electric power transmission plant in Switzerland is that recently opened at Frinvillier, the water power at that place averaging about 350 H. P., being transmitted to a paper factory at Biberist, over a distance of nearly 18 miles. At both the generating and the receiving stations there are two continuous current dynamos connected in series, each of the generators supplying a current of 43 amperes and 3,000 volts, so that a total voltage of 6,000 is carried by the overhead transmission line. The latter consists of two copper wires, each 7 mm., or about 0.28 in., in diameter, carried on porcelain insulators on 30-ft. poles A direct telephone line connects both stations.

Mortar in Winter.

During the building of the City Theatre at Zurich, Switzerland, which had to be continued during the winter months, Portland cement mortar was used with common salt, the whole being mixed with warm water. Tests of the strength of this mortar are now being made by the Vienna Building Department. The addition of soda instead of salt or alcohol, which latter has been proposed in several instances, is referred to in the *Génie Civil*, the proportion of soda used being about one kilogram to every five liters of water, the solution being kept at a temperature of 86 deg. Fahr. This solution may be diluted to about one-half its strength, and used as required in mixing small quantities of mortar at a time. The sand as well as the bricks or stones should be warmed if possible. One of the objections to this mixture is that the masonry remains damp for a long time, and its appearance suffers considerably from efflorescence. When used under water, moreover, it does not harden very readily. Some of the authorities quoted deprecate the admixture of salt, but testify in favor of the plan of employing warm, freshly slacked lime, as followed in Norway. All of them, however, agree that the use of common mortar at freezing temperatures should be avoided, as should mortar which has been thawed out after having been frozen.

The Berlin Underground Railroad.

In the matter of the much-talked-of electric underground railroad project for Berlin, Germany, the point has repeatedly been emphasized by various German authorities that, before beginning work on the whole proposed system, the feasibility of the undertaking should be first demonstrated by the construction and operation of a trial section. Application has, therefore, recently been made to the municipal authorities by the "Allgemeine Elektricitäts Geselischaft," the projectors of the enterprise, for the privilege of building such an experimental tunnel section, to be about 300 ft. long, and it is thought likely that this preliminary work will soon be commenced.

Brake Beam Patents.

The Examiners-in-Chief of the United States Patent Office, before whom the appeal on the interference case between the National Hollow Brake Beam Co., of Chicago, and the American Brake Beam Co., owners of the Pungs patent, had been carried, have decided in favor of the American Brake Beam Co., and the concluding paragraph of their opinion reads as follows: "Pungs remains unimpeached and uncontradicted in any important item, and as to matters in which he could be refuted by other testimony he is as competent as any other witness. We find that Pungs is the first to conceive of this invention and the first to reduce it to practice, and affirm the decision of the Examiner of Interferences that he is the prior inventor."

The Busk-Ivanhoe Tunnel.

The tunneling operations on the Busk-Ivanhoe tunnel on the line of the Colorado Midland are now under the direct charge of Mr. B. H. Bryant, Superintendent of the road and Chief Engineer of the Busk Tunnel Railway Co. Mr. M. H. Keefe, of Helena, Mont., who built the Wickes tunnel on the Montana Central got the contract for the Busk tunnel in July, 1890. He voluntarily surrendered charge of the work on July 21, last the three years' exposure in the high altitude having seriously affected his health. Mr. Keefe had completed 8,478 ft. of the tunnel, leaving 915 ft. between the headings. The report on Aug. 15 showed that 644 ft. of tunnel remained to be bored, and it is now expected that the headings will meet in the latter part of October.

Locomotives in Japan.

Japan's railroads at present have a total locomotive equipment of 206 engines, 200 of which are of English, four of German and two of American make. The last are of the mogul type and were built at the Baldwin works. The German engines are rack-rail locomotives built on the Abt system.

THE SCRAP HEAP.

Notes

The Chesapeake & Ohio is to build a hospital at Huntington, W. Va.

The New York Central has discovered counterfeit tickets reading from New York to Buffalo.

Texas now has a law permitting trains to run over grade crossings without a special stop, if approved interlocked signals are provided.

The West Virginia Board of Public Works has just made up its assessment of railroad property in that state for taxation. The total valuation is $22 261,829.

The petition of Felice Tocci for an injunction restraining the city of New York from paying its portion toward the elevation of the New York Central tracks in Park avenue has been denied by Judge O'Brien.

A Northern Pacific train was robbed near Stillwater, Mont., on the night of Aug. 26. The robbers got only $52, however, and seem to have taken only such sums as were given up on very slight intimidation.

A large meeting of railroad employees was held at Hazleton, Pa., last Sunday, at which, according to newspaper reports, federation of different classes of employees was discussed. The details of the reports, however, do not show that there were many in attendance other than engineers.

The Pennsylvania Railroad is strenuously opposing, in the courts of Pennsylvania, the right of street railroad companies, especially those using electric power, to lay tracks across those of a steam railroad. An injunction has lately been secured at Norristown, Pa., and another case is pending at Bryn Mawr.

A shipment of $4,000,000 in gold was sent last week by the government from San Francisco to New York by the Wells-Fargo and United States Express companies. The gold weighed about 20 tons and came by regular passenger trains. From Kansas City it came over the Chicago & Alton, the Lake Shore & Michigan Southern and the Delaware, Lackawanna & Western.

Leon Carrier, a grain merchant of Quebec, has been arrested for fraudulently obtaining possession of 60 carloads of flour, with the proceeds of which he ran away. He was in the habit of receiving a good deal of flour on bills of lading indorsed over to him by other parties, and succeeded in getting this flour on the promise of surrendering the bills of lading later.

On Saturday night last, the wooden arch of the 1,700 ft. tunnel on the line of the Cleveland & Marietta Railroad, six miles from Cambridge, O., took fire and burned out. A part of the tunnel was through a coal vein and this also took fire. Fire engines from Zanesville were sent to the tunnel and succeeded after a day's work in putting out the fire, but not till a considerable portion of the roof of the tunnel had caved in. It will take several thousand dollars to repair the damage.

The Union Pacific has on hand a queer contest in Pueblo, Col. During a recent flood in the Fountaine caused by a cloudburst in the foothills, at the base of Pike's Peak, large quantities of rubbish lodged against the wooden piling of a bridge of the road that crosses the stream at an angle of about 60 deg. and resulted in an overflow that caused considerable damage to the residents in the vicinity. The citizens assembled at the bridge and after considering what was best to be done, finally decided to burn the structure. Coal oil was poured upon the bridge and it was set afire. Railroad men tried to stop the fire but were prevented by the crowd. On the next day citizens enjoined the company from repairing the bridge, and then the road obtained injunction papers against the city authorities. Both sides being restrained from action now await the action of the courts. The bridge in question was formerly used as the main line, but of late years it has served as a connection to a storage track which is but little used.

Grade Crossings in Buffalo.

The Buffalo Grade Crossing Commissioners have filed a report on the grade crossing question in that city. The principal deviations from the plans heretofore discussed are as follows: All the roads crossing Hamburg street will be spanned by a viaduct; the crossings of the Lake Shore, Buffalo Creek, Nickel Plate and Western New York & Pennsylvania roads at Perry street will be furnished with viaducts instead of foot bridges; subways will be provided for the West Shore and New York Central at Swan, Seymour, North Division, Lord and Smith streets; a viaduct will be built over the Erie at Abbott Road, where no change from the grade crossing was contemplated before. By the new plan, whether the grade is raised or depressed, the change will be made for the full width of the street, with the exception of Michigan, Chicago and Louisiana streets north of Exchange street, where passageways at grade on either side of the approaches will permit access to Exchange street. A public hearing will be given Sept. 4 by the Commissioners in their office. The Citizens' Grade Crossing Association is still opposed to the contemplated changes, and will oppose the execution of the plan by an application to the Supreme Court for an injunction restraining the Commissioners from carrying out their contract with the railroads.

English Railroad Notes.

The question of the profit of second-class passenger traffic on English railroads still has some interest. During the first six months of this year the Great Western carried 210,000 fewer second-class passengers than the first half of last year and the decline in receipts was £10,000. There was, however, a falling off of 76,000 in the first-class passengers and £3,000 in the receipts from that class. The Lancashire & Yorkshire lost 28,459 second-class passengers and 9,970 first-class, the receipts having fallen off £7,661 and £906 respectively. The Great Western also lost in second-class passengers, while it gained in first-class. The Great Eastern abolished the second-class the first of last January. The loss in receipts seems to have been exactly made up in the other classes. On the Liverpool Overhead there are but two classes; on the South London Underground but one class, and it is proposed to have two classes in the new metropolitan lines.

The Liverpool Overhead (electric elevated) railroad was opened for the public on the 6th of last March. A ten-minute service was run until the 22d of May, and since then the interval has been five minutes. The total number of passengers carried up to June 30 was 1,371,000, of whom 957,000 were second class. The gross receipts were £12,352; operating expenses £6,999. The earnings are sufficient to pay all first charges and 5 per cent. on the preference stock. Extensions of the line are already in hand.

The American mail service by way of Holyhead and Queenstown which was interfered with somewhat by the improved service by way of Southampton, had another blow when the government decided to withdraw a subsidy for special trains and steamers from Queenstown on the arrival of the American mails. The result of waiting for regular trains has been that letters for Liverpool, etc., landed at Queenstown, have actually arrived at Liverpool after the steamer. A deputation has just waited on the Postmaster-General, and it is hoped that the subsidy will be continued.

South American Notes.

Civil Engineer João Felipe Pereira, of Ceará, has been appointed Minister of Foreign Affairs of Brazil.

The firm of Medici, Lavalle & Co. has purchased the Western Railroad of Uruguay, and will also undertake the construction of the Zabala Canal.

The Central Railroad of Brazil carried 10,684,135 passengers in 1892, against 9,394,069 in 1891. The freight traffic decreased from 607,800 tons to 591,700 tons. The number of locomotives has increased from 192 to 225.

Within the past two weeks there has been an important rise in exchange on Brazil, and in consequence the quotations of Brazilian railroad stocks have materially advanced. There is appearance of an improvement in the financial situation in Brazil, as a result of which there may be a revival of railroad building in that republic this autumn.

Civil Engineer Carlos Garcia Zúñiga, Commissioner from the Republic of Uruguay, will undertake to organize in the United States a syndicate of capitalists for the construction of important public works in that country. The projects contemplated are the construction of a port at Montevideo, in accordance with the Woldorpp plans, and the extension of the railroad system.

Spanish American Notes.

The Argentine National Railroad Board has been reorganized, with Miguel Tedin, C. E., as President.

The policy of the Saenz Peña administration in Argentine has suddenly assumed startling vigor under the new Cabinet organized by Dr. Del Valle.

Messrs. W. R. Grace & Co. are having two new steamers built in England for their New York and Pacific steamship line, to run between New York and ports on the west coast of South America.

Mr. W. L. Cherry, concessionnaire for the railroad between Buenaventura and the Cauca Valley, Colombia, has secured additional capital in England, and will continue the construction of the line at once. He is stated to have obtained Chinese laborers for the work.

It is announced that a syndicate is being formed for the purpose of consolidating the various iron companies of Mexico under a single management. The scheme also involves the establishment of extensive works at Monclova, State of Coahuila.

The uprisings, which gave warrant for the recent press reports of an impending general revolution in Argentine, were aided by the power which the local governors possessed through the maintenance of large forces of militia as an adjunct to the police system. This power has now been broken by the summary order for the disbandment and disarming of these troops, which has been followed up by the sending of government agents through the country to receive the arms and ship them to Buenos Ayres. Contrary to the anticipations of the revolutionary leaders this move on the part of the government has awakened enthusiasm among the people, and has turned public opinion in favor of Saenz Peña.

Arkansas Railroad Taxes.

The Arkansas Board of Railroad Commissioners has completed its assessment of the railroads of the state. The total length of road is 2,290 miles, an increase of 32 miles over 1892. The total valuation is $19,311,527, an increase of $783,281 over last year. The assessment of the Cotton Belt is increased $500 per mile, but the main increase is on the lines leading into St. Louis. The half valuation of the Memphis bridge is $521,000.

Derailment in Wales.

The quietest spot in the Taff Valley, in South Wales, was on the evening of Aug. 12 the scene of a railroad accident which resulted in the death of 12 persons and serious injury to 28 and minor injuries to at least 30 more Six coaches of the afternoon train upon the main line of the Taff Vale Railway were thrown down an embankment 60 to 70 ft. high. The train from Pontypridd to Cardiff comprised 15 coaches and 2 vans, 4 of the coaches belonging to the Cambrian Railway Company and the remainder to the Taff Vale Railway. The Government inquiry into the disaster was held by Major Marinden at Cardiff on the 15th. A good deal of evidence was taken, the principal witness being William Durston, the driver of the train, who said he had been in the service of the company for 27 years, and a driver for over 13 years. He had been accustomed to this line the whole time. On leaving Treforest he ran at his usual speed, and on passing the foot-bridge he was going

about 30 miles an hour. Just by the foot-bridge he felt a knock on the left-hand side. Looking around he saw the brake van off the road. He at once shut off steam, and was about to apply the continuous brake when he saw that it would not do, because he would pull the train up too suddenly. He considered it better to try and keep the van straight. He put on steam and shut it off again, and he succeeded twice in keeping the carriage straight. The third time he found the couplings were disconnected, and the train went over the bank at once.

The Bridge Wreck at Milton, Va.

We have heretofore referred to the wreck of a b ridg and a passenger train on the 16th of this month on the Atlantic & Danville Railroad. The engine, tender and one car got across safely, but two passenger cars and a sleeping car went down with the bridge. The conductor was killed, as were six other persons, and four persons were slightly injured. The newspaper accounts stated that the creek was high and that it was thought that the foundations had been undermined. From the best information that we can get this does not seem to have been the case. The bridge was over the County Line Creek in Halifax County, Va., near the North Carolina state line; it was a Howe truss, built in August, 1889, of 80 ft. span and 45 ft. from the bed of the stream. It stood on iron piers resting on stone foundations. There had been no high water for several weeks and the foundations do not appear to have been injured and will be used for a new iron structure. The officers of the railroad have not yet been able to ascertain the cause of the wreck. The span appears to have broken near the middle and examination showed sound timbers. The most accepted theory is that the front truck of the baggage car was derailed. The bridge was inspected last April and reported to be in good condition. The tie-rods were screwed up in May, but nothing else was done to it.

Home News from Abroad.

A freak of journalistic "enterprise" appeared in a recent issue of the *Genie Civil* and is reproduced in the *Zeitschrift* of the Austrian Engineers' and Architects Society. It is a description, given in apparently good faith, of a species of endless belt elevator, said to have been put up by the Pennsylvania Railroad at its Jersey City terminus, to carry passengers from the street level to the elevated waiting-room floor. The contrivance, as described, is said to work on the belt conveyor principle, the belt being made up of jointed sheet metal plates, and running on an incline around large pulleys, one of them being at the street level and the other at the station floor level. Power is said to be furnished by an electric motor, driving the belt pulleys through intervening gears. The belt is represented as running at a slow enough speed to permit passengers to easily step on and off. The whole arrangement is described in detail, sizes and working speeds are given, and the enterprise of the Pennsylvania road in providing the installation is commended. It would be interesting to know just where this fanciful story started.

Coal in Colombia.

A discovery which is likely to have a considerable influence in the railroad developement of northwestern South America, viz., of workable beds of coal in Colombia, is reported in the *Bulletin* of the American Iron & Steel Association. A Washington engineer, Mr. C. F. Z. Caracristi, spent last winter and spring exploring for coal. His report says that adjacent to the Gulf of Darien, in the departments of Canca and Bolivar, 8,000 square miles of coalbeds have been found with 2,000 additional square miles in the department of Magdalena. The coal, which is the property of the Colombian Government, is anthracite, bituminous and cannel, and is said to lie in beds from 3 to 20 ft. thick. There are no railroads in Canca, but in Bolivar a road from Savanilla to Barranquilla, some 16 miles, has been working for about 20 years, and another road from Cartagena to the Magdalena River, about 50 miles, is nearing completion. In the department of Magdalena about 30 miles of railroad have been built out of Santa Marta, as part of a railroad running parallel with Magdalena, but on high ground, to Bogota. During the fiscal year 1891-2 the Columbians imported from this country 1,400 tons of anthracite and 24,552 tons of bituminous coal.

A New Torpedo Placer.

Mr. W. H. Farrell, of Bethlehem, Pa., has invented what he calls a torpedo setter, for placing signal torpedoes on the rail while the train is in motion. The instrument consists chiefly of a double star shaped wheel about 10 in. in diameter with four projections shaped to suit the rail. The axle of the wheel is bound in rubber. By a simple mechanism the torpedo is placed in the setter, which will hold from one to four. The setter is fastened to the caboose or car, and by pressing a lever will descend to the rail and leave a torpedo securely fastened. The projections are elastic and will fit any rail, while the rubber on the axle prevents the torpedo from exploding, no matter how hard the lever may be forced down. When not in use the setter will be about an inch above the rail. It can be raised to be loaded with torpedoes while the train is in motion.

London & Northwestern Railway (of England).

The following is an abstract of the semi-annual report, for six months ending June 30, 1893. Mileage, 1890; capital paid up, $529,224,305 (computed at £ equal $5):

Earnings.

Passengers	$8,757,460
Freight	9,719,725
Mineral	5,516,795
Live stock	410,115
Parcels, horses, carriages, dogs	1,910,020
Mails	469,950
Rents, etc	431,815
Dividends	413,020
Balance brought forward	403,360
	$28,032,290

Expenses.

Working expenses	$15,537,080
Interest on debenture stock	2,627,240
Dividends, 4 per cent. per annum on guaranteed and preference stocks and 5¼ per cent. per annum on consolidated stock	9,043,695
Chief rents, leases, etc	566,975
Balance carried forward	257,300
	$28,032,290
Number of passengers carried during the six months	$32,204,935
Number of tons of freight carried during the six months	19,320,511
Mileage of passenger trains	10,410,787 miles
Mileage of freight trains	9,606,086 "

BRIDGE BUILDING.

Baltimore, Md.—The County Commissioners will build a new iron bridge over a stream at Phœnix. It is to be 36 ft. long and 16 ft. wide.

The City & Suburban Railway Co., Nelson Perin, President, is receiving bids for a viaduct to be built across Jones' Falls, 1,100 ft. long, to carry the electric railroad.

Edmonton, N. W. T.—Citizens are agitating the erection of an iron bridge over the Saskatchewan River.

Medford, Ont.—The council has had plans prepared for a new bridge over the Big Head River at Trowbridge street.

Media, Pa.—The County Commissioners have been sustained by the Court for their action in awarding contracts for the erection of bridges at Folsom and Shoemakerville to Geo. C. Hoopes and the Berlin Bridge Co., at $3,700 and $43,700 respectively. The Court holds that the Commissioners can make contracts for bridges without competitive bids.

New York City.—Bids for the construction of the new Third avenue bridge over the Harlem River were opened in the office of the Department of Public Works on Aug. 29. There were eight bidders, M. S. Coleman, John J. Hopper, Rodgers & Farrell, Hart, Anderson & Barr, Andrew Onderdonk, Stewart & McDermott, Clinton Stephens and Sooysmith & Co.

Parkersburg, W. Va.—The project for building a bridge across the Little Kanawha River at this point is again being discussed. It is conceded that the bridge is needed, and it would have been built several years ago except for the inability of those interested to agree as to the location for the approaches in the town. The two principal streets mentioned are Market and Julianna, and the representatives of those streets have now proposed the plan of building the bridge to land upon a street between the two, with approaches from both streets, thus putting the two streets upon equal footing. This proposition will be presented to the county court at its next session. The court is prepared to build the bridge as soon as the local differences are settled.

Peoria, Ill.—The Board of Supervisors has let a contract to M. Halligan for an iron bridge over a highway for $850. The Wrought Iron Bridge Co., of Canton, O., was awarded the contract for the bridge across the La Marsh Creek in Limestone for $1,440.

Pittsburgh, Pa.—The Ohio River bridge of the Pittsburgh & Lake Erie is being widened preparatory to making it a double track structure. This same company will build four bridges along the line of the McKeesport & Bellevernon branch at Lock No. 3, Bell Bridge, Sunnyside and Iron City.

York, Pa.—Viewers have reported favorably upon the erection of a new bridge across the Little Conewago in Jackson Township.

RAILROAD LAW—NOTES OF DECISIONS.

Carriers of Goods and Injuries to Property.

In Texas a shipper of cattle made a contract with a railroad company, which recited that, "as a condition precedent" to his right to damages for loss of stock in transit, he should give notice in writing of his claim therefor to a general officer of the company, or its nearest station agent, or to the agent or a general officer of the road carrying the stock to destination, within one day after delivery at the destination, and a failure to comply with these terms should bar recovery, but the contract did not name any person to whom notice should be given, or where he might be found. The Supreme Court rules that a finding that the contract was unreasonable would not be disturbed.[1]

In the same state young trees were consigned by an express company to a person at a certain station, in care of the railroad agent, who was agent also of the express company. The freight and express received at the station were kept in the same room. After the trees had been there several weeks, the consignee sent an order addressed to the "R. R. Agent," directing the latter to deliver to bearer "any freight" there might be for the consignee. The agent reported that there was nothing for him. The Supreme Court rules that the demand was not sufficient to charge the express company with liability for the agent's failure to deliver.[2]

A Missouri statute provides that railroad corporations shall print schedules showing the rates of freight established by them not to exceed the maximum rates established by law; that copies shall be posted in every depot, and filed with the railroad commissioners; and that from the date of such filing the rates scheduled shall not be in excess of statutory maximum rates thereafter in force, and shall be deemed the established rates until changed as provided by this act. Section 2,631 provides that all railroads of the state shall be common carriers, and prohibits unreasonable charges. Section 2,643 provides that on violation of these sections the person injured may recover three times the amount of damage sustained. The Supreme Court holds in an action to recover penalties for charging plaintiff unreasonable rates on coal that a petition which failed to allege that the rates charged were in excess of the rates fixed by defendant and filed with the railroad commissioners and posted in defendant's depots, and which also failed to state that the charges were in excess of the maximum rates fixed by the railroad commissioners or by the statute, stated no cause of action.

In Texas, in an action against a carrier to recover the statutory penalty for refusing to deliver flour shipped from St. Louis, Mo., to Brenham, Tex., directed to plaintiff by the bill of lading, it appeared that the company of which the purchase was made, acting for plaintiff, delivered the car to the St. L., A. & T. road, a common carrier into Texas, making connections with the G., C. & S. F. road and defendant road, both leading to Brenham. The bill of lading stated that the freight was to be carried via the G., C. & S. F., on which the established rate on flour was 40 cents per 100 lbs., but it was turned over to defendant, on which the established rate was 58 cents, and by defendant carried to Brenham. On the arrival of the car, plaintiff offered defendant the amount named in the bill of lading—40 cents per 100—which was declined, and the amount of its established rate demanded, which plaintiff refused to pay. The Supreme Court rules that the shipment was interstate commerce, and as defendant would have been answerable under the acts of Congress requiring an established rate for freight, and making it a misdemeanor to accept more or less than such amount, if it had accepted less than 53 cents, the statute of Texas imposing a penalty for a refusal to deliver freight on tender of the charges specified in the bill of lading would not apply.[3]

In Iowa in an action against a railroad company for placing a dead steer on the highway, whereby plaintiff's horse was frightened, it appeared that the steer, which had been injured by a train, was removed from the track by defendant's employees, and killed. There was evidence to show that the section boss left the carcass at a point about 29 ft. from the track, that he told the owner's son to do what he pleased with it, and that it was deposited on the highway by others than the employees of defendant. The Supreme Court holds that it was the duty of defendant's employees to remove or bury it, in order to prevent its becoming a nuisance to the public, and the fact that they permitted others to do so would not absolve defendant from liability for injuries resulting from negligence in such removal.[5]

In Colorado, a fire burned over plaintiff's farm, which abutted on defendant railroad company, and plaintiff sued for damages. Railroad companies are by statute made absolutely liable for all fires occasioned by the operation of their roads. When the fire broke out plaintiff was not in the vicinity, and no witness was produced who saw the fire set or discovered it until about 2 o'clock, when it was under considerable headway. How the fire started was undetermined. The Supreme Court holds that a verdict fixing liability on defendant could not be sustained, without proof to establish the relation of cause and effect between the operation of the road and breaking out of the fire, and testimony of plaintiff that a freight train usually passed there about 11:30 in the morning was insufficient when he did not attempt to show that a train passed the point daily at 11:30, or that any passed on the day of the fire.[6]

Injuries to Passengers, Employees and Strangers.

In Missouri it is laid down that a carrier need not wait for a passenger to reach her seat before starting the train, unless there is some special reason, as in case of a person outside of a coach, and in case of such exception the carrier must have notice thereof.[7]

In the same case it is ruled that where access to a train at a station is easy, it is not the duty of the carrier's employees to assist a passenger in getting on board.[8]

In Georgia it is held by the Supreme Court that a railroad has a right to employ a colored train hand, and a conductor may properly call on him to assist in ejecting a passenger who ought to be ejected from the train; and if a white passenger is wrongfully ejected from a train, the fact that a colored train hand was called on to assist in so doing will not make the company liable for greater damages than would be recovered if the train hand had been a white man.[9]

The Supreme Court of Pennsylvania rules that the driver of a street car is bound to take more care of an old person than of one in full vigor, and whether starting a car in the usual and ordinary manner, after an old lady has entered it, is negligence is a question for the jury.[10]

In Indiana it is ruled by the Supreme Court that in an action against a railroad for injuries to a passenger caused by the train starting without warning before plaintiff had time to alight, a general verdict in plaintiff's favor is not inconsistent with a special finding that the train stopped at the station for two minutes, since plaintiff may have been so impeded by her valises and her two children, and so delayed by other persons leaving the car or entering it, that the conductor, knowing the facts, and knowing or being bound to know and to recollect that she was to alight at that station, was not free from negligence in failing to give her a longer time in which to alight.[11]

In West Virginia the plaintiff alleged that he had a ticket over defendant's road, and boarded a freight train, which did not carry passengers, in the belief that the ticket was good on such train; that the conductor refused to stop the train and ordered him to get off while it was running at a high rate of speed; that the conductor, in violent language, threatened to eject plaintiff from the train if he did not obey the order, and had force at his command to execute such threat; and that plaintiff believed that resistance would result in greater injury than leaving the train; and that he jumped and was injured. The Supreme Court holds that there was a sufficient allegation of compulsion to excuse plaintiff from the charge of contributory negligence in jumping.[12]

In Georgia it is held that under the Georgia statutes a railroad company is liable for injuries to the person of an employee by the negligence or misconduct of other employees of the company, without negligence on his part, whether such injuries are connected with the running of trains or not.[13]

In New York plaintiff's intestate, a switchman, was run over and killed by an engine in defendant's freight yard after operating the switch to allow some cars to pass. He went from his switch onto the track on which the engine which ran over him was following the cars which he had switched. The engine was moving at the rate of about three or four miles an hour, and intestate was apparently trying to cross in front of it. He was heard by the engineer to call out, and the engineer immediately stopped his engine, and found him under the tender. The Supreme Court holds this insufficient to warrant a finding that the injury was occasioned solely by defendant's negligence.[14]

In Texas it appeared that plaintiff was a locomotive engineer in the employ of another railroad company, which used defendant's tracks; that plaintiff was operating one of his employer's trains on defendant's tracks, under orders of defendant's dispatcher to meet one of defendant's trains at a certain point; that the engineer of defendant's train violated his orders, and ran by the meeting point, and plaintiff was injured in a collision that followed. The Supreme Court rules that plaintiff and the engineer of defendant's train were not fellow servants.[15]

In Tennessee, the Supreme Court rules that notice to a conductor of a defective "hand hold" was notice to defendant, and his promise to have the defect repaired soon was sufficient assurance to justify a brakeman in believing that it would be remedied within a reasonable time, though the conductor was not himself authorized to make the repairs.[16]

In Texas, the plaintiff, a brakeman employed by defendant, while climbing a ladder on the side of a box car, was knocked from the train and injured by one of the stays of the bridge over which it was passing. The evidence showed that he was in the discharge of his duty in response to a signal, and was without negligence; that his body came in contact with the stay because the track was 3½ in. nearer to that than to the opposite side of the bridge. The Supreme Court rules that a judgment for plaintiff would not be disturbed.[17]

In New York, the railroad company's engine was propelled through a city street after dark, without any headlight and without ringing a bell, and ran over plaintiff, who testified that before crossing the track he looked around, but neither saw nor heard the engine, and his testimony was corroborated by that of another witness, who crossed at the same time with him. It also appeared that there was no train attached to the engine, and that it was comparatively noiseless. The Supreme Court holds that a verdict for plaintiff would not be disturbed.[18]

The Supreme Court of Mississippi rules that the statute providing that railroad companies shall cause the bell on each locomotive to be rung or the whistle to be blown at a certain distance from a crossing on a highway or street, and to continue so doing until the crossing is passed, does not apply to towns, but to the highways in the country.[19]

[1] M. Pac. v. Paine, 21 S. W. Rep., 78.
[2] Wells, Fargo & Co. v. Windham, 21 S. W. Rep., 422.
McGrew v. Mo. Pac. Ry. Co., 21 S. W. Rep., 463.
[4] Dillingham v. Fischl, 21 S. W. Rep., 554.
[5] Baxter v. C., R. I. & P., 54 N. W. Rep., 350.
[6] D. & R. G. v. Morton, 32 Pac. Rep., 345.
[7] Yarnell v. K. C., Ft. S. & M., 21 S. W. Rep., 1.
[8] Yarnell v. K. C., Ft. S. & M., 21 S. W. Rep., 1.
[9] Cent. R. & B. Co. v. Strickland (Ga.), 16 S. E. Rep., 352.
[10] Holmes v. A. & T. Co., 25 Atl. Rep., 640.
[11] O. & M. v. Smith, 32 N. E. Rep., 809.
[12] Boggess v. C. & O. Ry., 16 S. E. Rep., 525.
[13] Georgia R. & B. Co. v. Miller, 16 S. E. Rep., 939.
[14] Dering v. N. Y. C. & H. R., 22 N. Y. S., 344.
[15] Tex. & P. Ry. v. Easton, 21 S. W. Rep., 575.
[16] L. & N. v. Kenley, 21 S. W. Rep., 326.
[17] Ft. Worth & D. C. v. Graves, 21 S. W. Rep., 606.
[18] Donovan v. L. I., 22 N. Y. S., 52.
[19] L., N. O. & Tex. Ry. v. French, 12 South. Rep., 338.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Central Pacific, semi-annual, 1 per cent., payable Sept. 15.

Chicago & Northwestern, quarterly, 1¾ per cent. on the preferred stock, payable Sept. 21.

Old Colony, quarterly, 1¾ per cent., payable Oct. 2.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Florida Central & Peninsular, special, Jacksonville, Fla., Sept. 15

Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 20.

Iowa Central, annual, New York City, Sept. 8.

Louisville, New Albany & Chicago, annual, Indianapolis, Ind., Sept. 20.

New York, Ontario & Western, annual, New York City, Sept. 27.

St. Louis Southwestern, annual, St. Louis, Mo., Oct. 3

Toledo & Ohio Central, annual, Toledo, O., Sept. 4.

Toledo, St. Louis & Kansas City, annual, Toledo, O., Sept. 13.

Wabash, annual, St. Louis, Mo., Sept. 12.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Roadmasters' Association of America* will hold its annual meeting at Chicago on Sept. 12, 13 and 14. The headquarters will be at the Southern Hotel, Twenty-second street and Wabash avenue. The meetings will be held at Metcalfe Hall, No. 137 Twenty-second street. The programme of this meeting was published Aug. 18, p 628.

The *Master Car and Locomotive Painters' Association* will hold its next annual convention at Odd Fellows' Hall, Milwaukee, Wis., Sept. 13, 14 and 15. The headquarters of the Association will be at the Kirby House, corner of Mason and Water streets. The programme of this meeting was published in our issue of July 28, p. 575.

The American Association of General Passenger and Ticket Agents will hold a semi-annual meeting at the Plankinton Hotel, Milwaukee, Wis., on Sept. 19.

The Western Railway Club meets in room 730, The Rookery Building, Chicago, on the third Tuesday in each month, at 2 p. m. The meetings have been adjourned to Sep 19.

The New York Railroad Club meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7.30 p. m.

The Northwest Railroad Club meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The American Society of Civil Engineers meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

PERSONAL.

—Mr. I. L. Morris has resigned his position as Manager of the Peoria Steel & Iron Co., of Peoria, Ill.

—Mr. John W Brock, of Philadelphia, was last week elected President of the Philadelphia, Reading & New England road, of which he is one of the largest bondholders.

—Mr. S. H. Purcell, who resigned last week as District Superintendent of the Georgia Pacific, received a silver set valued at $300 from the employees of his division before leaving Columbus, Miss., for Virginia, where he expects to spend a month.

—Mr. George H. Crosby, Vice-President of the Crosby Steam Gage & Valve Co., of Boston, has been elected President and General Manager of the Wiscasset & Quebec Railroad, which proposes to build about 50 miles of road in Maine.

—Mr. Frank B. Aglar, formerly General Freight and Passenger Agent of the Texas Central road, and previously General Agent of the Union Pacific at New Orleans, La., is now connected with the American Brake Beam Co., with headquarters at Chicago.

—Mr. Ambrose W. Bodle, who was for a long period Division Passenger Agent of the New York, Lake Erie & Western, with headquarters at Buffalo, but has acted as Northwestern Passenger Agent, at Detroit, since last May, has resigned from the service of the company.

—Mr. Lawrence S. Parsons, who has been Traffic Manager of the Louisville, St. Louis & Texas since January, 1892, resigned this week and the office has been abolished by Receiver Cox. Mr. Parsons was formerly General Freight Agent of the Louisville, Evansville & St. Louis.

—Sir Henry Tyler, President of the Grand Trunk Railroad of Canada, arrived in New York this week and left immediately for Canada to make his annual inspection of the lines of the Grand Trunk system, being accompanied by General Manager Seargeant and other officers of the Grand Trunk.

—Mr. W. W. Monroe has been appointed General Superintendent and Traffic Manager of the Beattyville & Cumberland Gap road, a seven-mile coal road in Kentucky. His office will be at Beattyville, Ky. Mr. Monroe was for a long time secretary of the New Orleans Freight Traffic Association.

—Mr. John S. McClure, President of the Moseley Iron Bridge & Roofing Co., of New York, died last week at his home in Brooklyn. The company has its factory in Jersey City. Mr. McClure had been connected with it for 20 years, first as Secretary and afterward as President. His son, Mr. John H. McClure, is now Treasurer of the company.

—Mr. William H. Truesdale, President and Receiver of the Minneapolis & St. Louis Railroad, has been appointed Receiver of the Minnesota, Wisconsin & Pacific road by the United States Circuit Court at St. Paul, in the suit recently brought by Eastern bondholders. The road is a leased line of the Minneapolis & St. Louis and is operated as the Canon Valley Division.

—Mr. William M. Green, who was recently elected General Manager of the Cincinnati, Hamilton & Dayton, has resigned the Presidency of the Griffin Wheel & Foundry Co., of Chicago, ending his connection with that company. He has been President of the company for about two years, or since he resigned as General Manager of the Cleveland, Cincinnati, Chicago & St. Louis.

—Mr. William C. Rivearson has been appointed General Passenger Agent of the Queen & Crescent system, to succeed Mr. David G. Edwards, who goes to the Cincinnati, Hamilton & Dayton. Mr. Rivearson is now General Passenger Agent of the Cleveland, Akron & Columbus, being appointed to the position last May. He was General Traveling Passenger Agent of the Chicago Great Western in 1892, and was formerly General Passenger Agent of the New York, Lake Erie & Western.

—Jean Daniel Colladon, one of the best known engineers of Switzerland and said to have been the oldest died recently at Coliny, near Geneva, at the age of 91 years. Mr. Colladon was the oldest member of the French Society of Civil Engineers, and also the oldest professor of the famous Ecole Centrale. He had been actively interested in the building of the Mount Cenis tunnel, and in recognition of his services in connection with that undertaking had been made a Commander of the order of St. Maurice and Lazare.

—The announcement of the appointment of Mr. David G. Edwards as General Passenger Agent of the Cincinnati, Hamilton & Dayton has been issued this week. The appointment of Mr. Edwards to this position has been anticipated since the resignation of Mr. E. A. McCormick to become Passenger Traffic Manager of the Cleveland, Cincinnati, Chicago & St. Louis. Mr. Edwards is at present General Passenger Agent of the Queen & Crescent system, a position which he has held since January, 1889. He was previously Assistant General Passenger Agent.

—Mr. F. Mertsheimer, Assistant Superintendent of Motive Power of the Union Pacific, with headquarters at Cheyenne, Wyo., has been transferred to Kansas City as Master Mechanic of the Kansas Division, and the former office has been abolished. Mr. Mertsheimer was formerly Master Mechanic of the Kansas Division until 1890, when he became Superintendent of the Wyoming Division of the Union Pacific. In January, 1891, the office of Assistant Superintendent of Motive Power at Cheyenne was created and Mr. Mertsheimer was appointed to that position.

—Chief Engineer Robert Moore, of the Merchants' Bridge & Terminal Company, St. Louis, will sever his connection with that concern on Sept. 1 next, and Mr. Herbert F. Taussig, a nephew of Dr. Wm. Taussig, and Chief Engineer of the St. Louis Bridge Terminal Co., will become Chief Engineer of the Merchants' Terminal company also. In pursuance of the recent agreement between the two bridge companies, the Engineering Departments of the two companies have been consolidated, and the engineer's office of the Merchants' Terminal will be removed to Mr. Taussig's office in the Union Station on Sept. 1. Mr. Moore will open an office as Consulting Engineer.

—Mr Hayward A. Harvey died at his home in Orange, N. J., Monday morning, Aug. 28, after an illness of five months. He was born Jan. 17, 1824, at Jamestown, N. Y. His father was Gen. Thomas W. Harvey, an engineer and the inventor of the gimlet point screw. The son was employed as draftsman by the New York Screw Co. from 1841 to 1850; in 1852 he went into the Harvey Steel & Iron Co., of Jersey City, of which his father was President. In the years which followed he made many inventions of considerable value, the most important of which was the system of rolling the thread on screws and bolts. In 1854 he founded the Wangum Steel Co. of Connecticut, and in 1895 the Continental Screw Co. of Jersey City. The work which has given him the greatest fame, and indeed has made his name known all over the world, and will perpetuate it in the vocabulary of steel working, is what is known as the Harvey process for casehardening steel. It is said that the first patents taken out by him for this process were in 1888, since that time the process has been adopted by various governments for the treatment of armor plate. At the time of his death Mr. Harvey was President of the Harvey Steel Company, and was Vice-President of the American Washer & Mfg. Co., of Newark, N. J. He was an active and useful citizen, and one of those fortunate men who die knowing that their lives have enriched the world.

ELECTIONS AND APPOINTMENTS.

Mexican Central.—W. H. Mealy has been appointed Superintendent of Terminals at Tampico.

Mexican National—Baker Mangum has been appointed Acting Superintendent of the San Luis Potosi Division.

Mexico, Cuernavaca & Pacific.—W. W. Mayberry has been appointed Superintendent and also Acting Freight and Passenger Agent, as recently reported, with headquarters at No. 13 San Juan de Letran, City of Mexico.

Paragould Southeastern—The stockholders met at Paragould, Ark., on Aug. 26, and elected S. W. Fordyce, O. McGowan, W. C. Hasty, A. Bertig and Saul Bertig, directors. W. C. Hasty was elected President A. Bertig, Vice-President, and Saul Bertig, Treasurer.

South Jersey.—The present officers of this company, now operating the road formerly known as the Philadelphia & Sea Shore road, are as follows: President, Thomas Robb; Vice-President, Logan M. Bullitt; Secretary, Thomas H. Wilson; and General Manager, James E. Taylor, all of Philadelphia; Superintendent, W. Grant Wilson, Tuckahoe, N. J. The principal office is at 333 Bullitt Building, Philadelphia.

Wiscasset & Quebec.—The following are the directors of this new Maine railroad: George H. Crosby, of Albion, Me., President; Henry Ingalls, Charles Weeks, George B. Sawyer, John C. Budd, of Wiscasset, Me.; Amos F. Gerald, of Fairfield; I. C. Libby, of Waterville; Ora O. Crosby, of Albion, and Crosby Fowler, of Unity. The President, George H. Crosby, has been elected General Manager; William D Patterson, of Wiscasset, Treasurer, and W. F. P. Fogg, of Waterville, General Counsel.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Baltimore & Ohio.—A cut-off is being constructed on the Washington branch near Relay station, Md., which will avoid a long curve and will lessen the distance between Baltimore and Washington. The new line is ready for tracklaying.

Boise Railway & Terminal Company.—The extension of the Union Pacific line which is being built into the city of Boise, Ida., under the charter of this company, is now practically completed. The line is about six miles long from the present Boise station of the Union Pacific, on the south side of the Boise River, to the new passenger station on the north side of the river, in the city limits of Boise. Trains are now running over the new road and will use the freight station temporarily until the new passenger station is finished, which will be about Sept. 15.

Boston & Nova Scotia Coal & Railway Company.—John W. Chandler, of Boston, and other New England and local directors are in Halifax, N. S., to secure a promise from the Provincial Government of a subsidy for the proposed railroad. It is said that the government has agreed to give a subsidy of $3,200 a mile for the proposed line between the Broad Cove coal mines and Orangedale station, on the Intercolonial Railroad, a distance of 33 miles. A subsidy of about the same amount has been promised by the Dominion Government. The contract for the entire road has been recently let.

Butte, Anaconda & Pacific.—The Montana Union road has secured several injunctions against this company in Silver Bow and Deer Lodge counties, which will serve to delay the completion of the construction work on the line. One suit is brought to prevent the road from using the right of way of the Montana Union at Butte, and another to prevent a crossing at grade near Anaconda, Mont.

Chattanooga Western.—The Directors of this company have purchased from Messrs. C. E. James and Newman Erb a majority of the stock of the Chattanooga Terminal road, the control of which will give the company an entrance into the city of Chattanooga. The Chattanooga Terminal owns a track beginning near the Tennessee River at the proposed site of the bridge to be built by the above company, and extending through the city to the station of the Nashville, Chattanooga & St. Louis. Several years ago the Chattanooga Terminal was operated as part of the Chattanooga Union road, but for some time past the operation of the line has been discontinued. T. J. Nicholl, President and Chief Engineer of the Chattanooga Western, has been elected President of the Chattanooga Terminal, and the other officers are T. D. Young, Vice-President; John Orr, Secretary and Treasurer; H. C. Beck and Franklin Harris, Directors.

Chicago, Indiana & Eastern.—The actual commencement of construction work on this road at Fairmount, Ind., last week by President F. A. Root was made a local event. The contract is let to the Schafer, Nichols, Watkins Co., of Louisville, Ky., for building the line between Fairmount and Muncie, Ind., 26 miles.

Chicago, St. Paul, Minneapolis & Omaha.—The extension of the road from Ponca to Newcastle, Neb., was formally opened for traffic last week and freight and passenger service inaugurated on Aug. 24. The extension is 15 miles long, beginning at the former terminus of the Ponca branch, and extending northwest to the Missouri River at Newcastle.

Coos Bay, Roseburg & Eastern.—The Southern terminus of this road is now at Myrtle Point, Or., eight miles beyond Coquille City, which has been the terminus of the operated line so far this year. A temporary bridge has been built across the north fork of the Coquille River, near Coquille City. The completed road is from Marshfield on Coos Bay south to Myrtle Point, 26 miles.

Helena & Castle.—The Helena papers report that arrangements have been completed by R. A. Harlow, of Helena, for the construction of this road from Helena to Castle, which is a large mining camp in Meagher County, Mont., directly east from Helena. The preliminary survey was completed a year ago by Gen. W. A. Haven, of Helena, and the location will be begun at once east of Helena and proceed to the Missouri River. Grading is reported to have already begun near Helena. The grading to the river is not difficult, but beyond the Missouri the location is through the Belt Mountains. The distance from Helena to the mines at Castle and White Sulphur Springs is 110 miles. The mining towns and Helena have voted subsidies of $240,000 for the road.

Marcy.—The incorporation of this company in Pennsylvania was recently noted. The new road is to be built in the interest of the Florence Coal Co., from the Elmwood Colliery of that company to the town of Pittston, and it will be about one and a half miles long. It will be built under the supervision of some officer of the Florence Coal Co. and will not be let to contractors. C. P. Matthews, of Scranton, is President, and Austin Moore is Engineer.

Mexico, Cuernavaca & Pacific.—The road has been accepted by the government and opened for traffic as far as Contreras, about 20 miles from the City of Mexico. The road is under contract to Cuernavaca, and the construction work is still going on, but the contractors have

only a small force at work. D. B. Smith is Vice-President and General Manager, with office at the City of Mexico.

Mexican Roads.—A contract has been signed by Luis Mendes for the construction of a railroad from the City of Mexico to the port of Tecuanapa, on the Pacific coast. The proposed line will pass through the States of Guerrerro, Puebla and Oaxaca.

Monterey & Fresno.—Maj. P. P. Dandridge is at the head of a party of engineers now making the final survey on the western end of this proposed road in California. The line has been located for about 10 miles from Monterey, and the surveyors are now nearing Salinas, the first large town on the route. A preliminary survey of the entire line from Monterey southeast to Fresno, about 160 miles, has already been made by the California Construction Co., which has the general contract to build the road.

Nelson & Fort Shepherd.—The construction of the line north of the international boundary above Fort Shepherd, B. C., is still going on actively. One of the officers who has recently returned for a trip over the line gives the following particulars of the work: Track has been laid and the road completed about 1½ miles beyond the Pend d'Oreille bridge, or within 2½ miles of Sayward. Beyond this point the grade is completed for several miles, and the tracklayers are laying rails. Three or four miles above Sayward they will come to the cañon of Beaver Creek and will have to stop work until it can be bridged. Porter Bros., the contractors, have all the bridge timber ready to be shipped to the front as needed. Over a thousand graders are distributed all along the 54 miles of road between Sayward and Nelson, and the grading is about half done. Most of the laborers are Swedes and Italians. The bridge work will delay the tracklayers. There are three crossings of Beaver Creek and one of the Salmon River, besides several cañons that call for bridges and trestle work. After leaving Sayward the road follows Beaver Creek for 10 miles through a rough, hilly country covered with tamarack, cedar and white birch. It is an ascending grade all the way from Sayward to Nelson, but there is little rock. Leaving Beaver Creek the road follows along the valley that runs with few breaks or turns for 40 miles to the foot of the bluffs on the shores of Lake Kootenai. The road will probably be completed during the winter. D. C. Corbin is President, and E. J. Roberts, of Spokane, Wash., is Chief Engineer.

New Roads.—G. W. E. Chamberlain, of Rockport, Mo., is reported to have secured subscriptions amounting to $450,000 to complete the proposed branch road through the northeastern part of Atchison County from Rockport to Tarkio, Mo. The road will be narrow gauge, about nine miles long, and will connect at both towns with the Chicago, Burlington & Quincy system.

Ohio Southern.—It is expected that trains will be running into Lima, O., early in October. The track is all completed from Springfield to Quincy, about half way, and work is being pushed toward Lima, 60 miles northwest of Springfield, as fast as possible. The grading is now about completed and the bridges built. Near Quincy, where the road crosses the Miami Valley, there is a deep cut and the company decided to build the bridge instead of filling in. The bridge is over 100 ft. high and 400 ft. long, probably the highest bridge in the state.

Pittsburgh & Mansfield.—A charter for this company was issued at Harrisburgh, Pa., on Aug. 23. The company proposes to build a line from Water street, Pittsburgh, to Mansfield, a distance of four miles, tunneling under Mount Washington. Elliott Holbrook, of Pittsburgh, has been elected President of the new company, and the other officers are as follows: C. J. McDonald, Secretary; William Roseburg, Treasurer, and E. K. Morse, Chief Engineer.

Pittsburgh, Morgantown & Fairmont.—The rails are now laid from Morgantown, W. Va., to a point 7½ miles north of the town and to within four miles of Cheat River. The gap will be closed within a week. On the other side of Cheat River the rails are laid south of Smithfield, Pa., to within five miles of the river, and this gap will be closed in about three weeks. The superstructure for the Cheat River Bridge will be delivered within two weeks, and can be put up in two weeks more if the river remains as it is.

Ronceverte & Lewisburg.—J. H. Price, of Ronceverte, W. Va., one of the incorporators, has presented a proposition to the County Court of Greenbrier County, W. Va., in which the company proposes to commence work on a railroad from Ronceverte to Lewisburg as soon as the two cities named shall subscribe $15,000 each to the capital stock. It is thought that this proposition will receive favorable action by the County Court and that the money will be subscribed. The road as surveyed extends from Lewisburg to the town of Cold Knob and from Ronceverte to Union, Monroe County. Besides connecting with the two towns mentioned, it would join the Chesapeake & Ohio Railroad.

Santa Fe, Prescott & Phoenix.—Late accounts from the line of this road state that the grade has been practically completed into Skull Valley, 18 miles south of Prescott, Ariz., thus completing one of the roughest parts of the work. The stretch of 12 miles north of Prescott, past Iron Springs, has, however, been the most difficult part of the line. From Skull Valley south, with the exception of a short distance near Congress, all is comparatively easy grading the entire distance to Phœnix.

Texas, Louisiana & Eastern.—James G. Smythe, Secretary of the company, reports that the tracklaying will soon be resumed on the section of about eight miles east of Cleveland, Tex., which is now graded. The rails have now been laid from Conroe east for a distance of 30 miles to a point beyond Cleveland station, where connection is made with the Houston, East & West Texas road.

Wiscasset & Quebec.—George H. Crosby, of Wiscasset, Me., has made an agreement to begin the construction of this road when $50,000 of the capital stock has been subscribed. The town of Wiscasset, the proposed southern terminus, has voted a large subsidy in aid of the road, and other towns will probably also vote to aid the project. The line is to begin at tidewater in Wiscasset, and extend through Alna, Whitefield, Windsor, China, Albion and Unity to Burnham station, about 50 miles.

GENERAL RAILROAD NEWS.

Baltimore & Lehigh.—The company has petitioned the United States Circuit Court at Baltimore for the appointment of one receiver for its entire property, in place of William H. Bosley, Receiver in Maryland, and Winfield J. Taylor, Receiver in Pennsylvania.

Beattyville & Cumberland.—The name of the Winchester & Beattyville road has been formally changed as above. The road now in operation is about seven miles long, connecting with the Kentucky Midland near the west branch of the Kentucky River, and extending to Beattyville, Ky. The plans of the projectors provide for the extension of the line until its southern terminus is at Cumberland Gap. Robert Wallace, of Versailles, Ky., is General Manager.

Chicago, Burlington & Quincy.—The financial statement for July is reported in the following table:

	1893.	1892.	Inc. or Dec.
Gross earn	$2,949,374	$3,214,136	D. $264,762
Oper. expen	2,020,976	2,118,058	D. 97,082
Net earn	$928,398	$1,096,078	D. $167,680
Fixed charges	830,000	815,076	I. 14,924
Surplus	$98,398	$281,002	D. $182,604
Seven months ending July 31:			
Gross earn	$21,925,382	$21,450,376	I. $474,406
Oper. expen	15,182,877	14,690,175	I. 492,702
Net earn	$6,742,505	$6,760,881	D. $18,296
Fixed charges	5,810,000	5,705,526	I. 104,474
Surplus	$932,505	$1,055,275	D. $122,770

Cleveland, Cincinnati, Chicago & St. Louis.—The earnings for June and the fiscal year are reported as follows:

	1893.	1892.	Inc. or dec.
Gross earn	$1,208,103	$1,301,019	D. $92,916
Oper. expen	870,660	900,283	D. 29,623
Net earn	$337,443	$400,736	D. $63,293
Fixed charges	226,613	233,684	D. 7,071
Surplus	$110,830	$167,052	D. $56,222
Twelve months to June 30:			
Gross earn	$14,669,055	$14,643,011	I. $26,044
Oper. expen	10,964,786	10,465,802	I. 498,984
Net earn	$3,704,269	$4,177,209	D. $472,940
Fixed charges	2,652,962	2,730,175	D. 77,213
Surplus	$1,051,307	$1,447,034	D. $395,727

Gettysburg & Harrisburg.—The Receivers are expected to allow a default in the payment of the interest of the six per cent. first mortgage bonds of this company due in October, and guaranteed by the Philadelphia & Reading. The Receivers are known to contemplate the abrogation of the lease. Their decision may not be made public until the interest is due in October. The road extends from Carlisle to Gettysburg, Pa., 32 miles.

Kansas City Circular.—A petition for a Receiver has been made to the District Court of Kansas at Kansas City, Kan. The company has never built any railroad. It was organized to build a belt line at Kansas City, Kan., connecting with a belt line to be built by the Interstate Switch Co., on the Missouri side. Rights of way were partly secured, but nothing further done, because the Union Terminal Co. began building over nearly the same route.

Louisville, New Albany & Chicago.—Figures from the annual report for the year ending June 30, 1893, were published this week. The earnings are reported as below:

	1893.	1892.	Inc. or dec.
Gross earnings	$3,490,988	$3,112,107	I. $378,781
Oper. expenses	2,355,866	2,114,948	I. 240,918
Net earnings	$1,135,022	$997,159	I. $137,863
All charges	954,840	931,245	I. 23,595
Surplus	$180,182	$65,914	I. $114,268

The gross earnings per mile were $6,499, against $5,794 the previous fiscal year, and the net earnings per mile $2,113, against $1,856. Included in the fixed charges is $72,000 of increased taxation, which the company maintains is illegal, and which it is now contesting in the United States Supreme Court. The number of passengers carried was 981,028, an increase of 75,693, and the freight tonnage was 1,739,324, an increase of 144,523 as compared with the previous fiscal year.

Mexican Southern.—Freight and passenger traffic on the road between the city of Pueblo and Oaxaca, Mexico, has been resumed after an interruption of about six weeks. The interruption was caused by disastrous washouts in the spring, soon after the road had been opened for through traffic. It required 2,000 men constantly employed to repair the damage.

Northern Pacific.—Judge Williams, in the United States Circuit Court at St. Paul this week, decided the long contested case of the St. Paul & Northern Pacific against the St. Paul, Minneapolis & Manitoba (now the Great Northern). The suit was commenced several years ago and involves 200,000 acres of land in the northwestern portion of the State of Minnesota, and at the point where the lines of the Northern Pacific and the Great Northern intersect. It was alleged that the land was deeded to the Manitoba road in 1866, and that a second deed was made in 1871. The suit brought by the Northern Pacific was to have these deeds set aside and the title vested in that company, the main question in dispute being which company first built its line and selected its land. The case was heard at the June term of court, and the decree filed is in favor of the Northern Pacific.

The Receivers have filed a petition in the United States Court at Milwaukee, Wis., for authority to issue receivers' certificates. The court is asked without delay to authorize an issue of $4,800,000, and, if consent is obtained, the Receivers will be enabled to obtain the release of securities pledged for existing outside loans, which are included in the list of securities on which the collateral trust loan is based.

Pennsylvania.—The statement of earnings of Eastern lines for July is published below:

	1893.	1892.	Inc. or Dec.
Gross earn	$5,605,285	$5,578,660	D. $26 625
Oper. expen	4,074,876	4,185,493	D. 163,867
Net earn	$1,530.409	$1,393,167	I. $137,242

Net earnings in 1891 were $1,775,184; in 1890, $1,355,465.

Gross earnings of Western lines in July increased $140,259 and net earnings increased $20,712. Total gross earnings of the system increased $113,634 and net earnings increased $157,954.

Pennsylvania, Poughkeepsie & Boston.—Arrangements have been made by the Receiver, H. H. Kingston, with the Lehigh Valley and the New York, Susquehanna & Western for the operation of this road by those companies under temporary agreements. The Lehigh Valley will operate the portion of the road which is located in Pennsylvania, between the Lehigh and Delaware rivers, from Slatington to Hainesburg Junction, N. J., 36 miles. The New York, Susquehanna & Western will operate the Eastern Division, the sections located in New Jersey and New York. Both companies pay to the Receiver a certain percentage of the gross earnings. The road was formerly operated by the Philadelphia & Reading, but the Receivers of that company canceled the lease on July 31, and the Pennsylvania Division has not been operated since that date.

Peoria, Decatur & Evansville.—The articles of consolidation of this company and of the Chicago & Ohio River road were filed at Springfield, Ill., last week. The capital stock is given as $8,500,000 and the company has authority to issue five per cent. bonds to the amount of $10,000,000.

St. Louis, Keokuk & Northwestern.—The company has filed an amendment to its charter authorizing an increase of its capital stock from $8,000,000 to $20,000,000. The road is a leased line of the Chicago, Burlington & Quincy, and the increase of stock is to provide for the extension of the line into St. Louis and the construction of the terminals in that city. The improvements are now well under way and it is expected to have the new extension and the terminals in the northern end of St. Louis in use in February next. The new work includes the construction of about 40 miles of railroad, including the new bridge across the Missouri River at Bellefontaine Bluffs; the building of new freight and passenger stations in St. Louis and the construction of extensive yards.

Velasco Terminal.—An agreement by which the International & Great Northern will assume the operation of this road is now under consideration. It is not known whether the proposed arrangement contemplates the purchase of a majority of the stock or a lease of the road. The Velasco Terminal was built in 1892 and extends from Chenango Junction, Tex., on the International & Great Northern, south of Houston, to tidewater at Velasco, Tex., about 20 miles.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Ill., Aug. 30, 1893.

The members of the Southwestern Rate Committee have been in session continuously since Aug. 22, considering the proposed agreement for the formation of the new association. The Rock Island has not yet indicated whether it will join the proposed association or not, and until it is known what its position is to be nothing definite is assured regarding the future action of the Santa Fe under its notice of withdrawal.

As was intimated in my letter of last week, the Western lines will make half-fare rates for all State days from points in their territory, with a return limit of seven days from points within 1,000 miles and ten days from points beyond this limit.

No action has yet been taken looking to the reorganization of the Trans-Continental Association, and the proposed meeting has been adjourned to Sept. 5. It is not now probable, however, that any decided action will be taken at that time, as the Canadian Pacific does not indicate any intention of again becoming a member of the association. The position taken by the Canadian Pacific is that it is ready at any time to join the association if satisfied that the agreement will be carried out in good faith, but its relations with this association in the past do not now warrant it in again becoming a member. It is now understood that the Great Northern is ready to join the new association, provided the other Trans-Continental lines, including the Canadian Pacific, become members. In the meantime, the Southern Pacific has again reduced freight rates, principally on dried fruits, on which a reduction of 40 cents per 100 lbs. is announced, effective Sept. 1, between California and Atlantic coast points. This rate will be met by the Santa Fe to Cuicago and Missouri River points. The other lines are inclined to charge the Southern Pacific with the intention of forcing a renewal of the Pacific Mail subsidy.

The lake and rail lines yesterday announced a cut of 5 cents per 100 lbs. on flour and grain from Superior and Duluth to Atlantic Coast points, making the rate 15 cents per 100 lbs. to New York.

Chicago and Ohio River lines are again in difficulty over passenger rates, the old question of the proportion which each line should carry causing the trouble.

The Western roads have agreed to accept the basing rates tendered by the Union Pacific, viz., $25 first class and $18 second class from all Missouri River points, Kansas City to Sioux City, inclusive, to Helena, Butte, Garrison, Spokane and Portland.

As was to be expected, the making of one-fare rates for State days is beginning to affect local rates. The first instance is in the application of special rates for Missouri day which will affect Iowa rates, and a ruling was asked for, which has been made by Chairman Caldwell, authorizing the Rock Island, the Chicago, Milwaukee & St. Paul, the Burlington and the Chicago Great Western to apply maximum rates at intermediate points on their direct lines.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines, for the week ending Aug. 26 amounted to 43,992 tons, against 44,852 tons during the preceding week, a decrease of 960 tons, and against 54,948 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Aug. 26		W'k to Aug. 19	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	5,697	13.0	5,780	12.9
Wabash	3,022	6.9	3,253	7.3
Lake Shore & Michigan South.	5,950	13.5	5,583	12.5
Pitts., Ft. Wayne & Chicago	4,874	11.1	5,219	11.6
Pitts., Cin., Chicago & St. Louis	6,143	14.0	6,319	14.1
Baltimore & Ohio	2,685	6.1	2,345	5.2
Chicago & Grand Trunk	3,852	8 8	3,626	8.0
New York, Chic. & St. Louis	4,500	10.2	3,797	8.5
Chicago & Erie	5,453	12.4	7,030	15.7
C., C., C. & St. Louis	1,816	4 0	1,900	4.2
Totals	43,992	100.0	44,852	100.0

Of the above shipments 1,261 tons were flour, 11,577 tons grain and millstuff, 10,796 tons cured meats, 12,307 tons dressed beef, 1,324 tons butter, 1,188 tons hides and 3,559 tons lumber. The three Vanderbilt lines carried 36.7 per cent., the two Pennsylvania lines 25.1 per cent. The Lake lines carried 72,163 tons, against 74,890 tons during the preceding week, a decrease of 2,727 tons.

(Other Chicago traffic news will be found on page 656.)